MID:COM 8000

Installation, Operation, and Maintenance Guide

Reference for Installing, Operating, and Maintaining the MID:COM 8000 Computer, Printers, and Electronic Registers

Including the MID:COM E:Count Electronic Register

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Section 1 – MID:COM 8000 Installation

Installation Overview

These instructions describe the procedures to install a standard MID:COM 8000 computer register on a fuel delivery truck. Instructions for installing and using optional or additional accessories are included with those accessories. Attention to detail will insure long-term reliability.

Mounting the Computer/Printer

The MID:COM 8000 is supplied with an aluminum pedestal for mounting in the cab of the truck. The pedestal uses a base plate that should be securely bolted to the floor of the truck, and preferably through a structural member. A support plate under the floor may be necessary to gain rigidity. Alternately, the braces supplied may be used for further support. The pedestal post supplied is usually too long for most installations and should be cut as short as practical to further help to reduce movement and vibration.

Position the pedestal so that the driver has good access to the keyboard and will be looking relatively straight on, or slightly down at the display. Here again, it is important to keep the unit as low as possible. Keep the unit clear of gearshift levers and other controls in the cab. Once the computer is mounted, tighten all set-screws and check for stability.

Power Hookup

The power cable assembly consists of a two conductor shielded cable for power, and a single conductor shielded cable for ignition pick up.

Route the single conductor cable from the computer to the vicinity of the fuse/breaker panel. Route the two-conductor cable to the vicinity of the truck battery. In both cases keep the cable protected from abrasive or moving parts, and secure with cable ties.

(continued)

Power Hookup (continued)

Make sure the negative terminal of the truck battery is grounded directly to the frame of the truck with a heavy conductor. The truck frame will be the connection point for all grounds.

Locate the closest connection point to the positive terminal of the battery. Usually the heavy conductor attached to the battery post terminates to a junction block close by. This is where the 12-volt power will be picked up.

Cut the two-conductor cable to a reasonable length that will allow the white wire and shield to connect to the truck frame and the red wire to the 12-volt source. Strip enough jacket to expose the shield and wires and then separate the wires from the shield. See note below on a convenient way to do this.

NOTE: To separate the wires from the braided shield, slide the shield back so it bunches up near the end of the jacket. Use a pointed tool to open up a window in the braid. With the same tool, pull one wire out at a time through the hole.

Strip the white wire of the two-conductor cable and twist it together with the shield. Crimp on one of the supplied terminals and attach directly to the frame of the truck with a nut and bolt. Make sure any paint or dirt has been scraped away.

Crimp terminal on the red wire and attach it to the 12-volt source. Wipe a small amount of grease on both terminations. This completes the power hookup.

Using a 12-volt test light, find a circuit at the fuse block which is only “ON” when the ignition is in the “RUN” position, and “OFF” in the “START” or “OFF” positions.

Cut and strip the single conductor cable and attach the center conductor to this circuit using an appropriate terminal or splice. Make sure the connection is secure and tie it off so that vibration will not knock it loose. The ignition sense line draws no power, so it is not necessary to find a heavy circuit. In fact it’s best to find a circuit that has little load on it. I.E. AM/FM radio circuit.

(continued)

Power Hookup (continued)

Terminate the shield and connect it to a nearby screw that is grounded. Use an Ohmmeter or test light to make sure the screw is grounded.

A length of wire is supplied to create a ground cable from the underside of the pedestal top to the truck frame (use a 10GA single conductor cable and ring terminal and attach it to the underside of the pedestal top). Run the cable down to the top of the pedestal base and terminate again. Now run a separate cable from the top of the pedestal base down to the frame of the truck, insuring all connections are making good metal contact. This completes grounding the pedestal. Once all grounding is complete the connection(s) to the frame can be soldered in place to insure they stay tight.

On some vehicles there may be an air-ride seat to provide greater comfort for the driver. The installation of these seats can result in the driver's seat being insulated from the chassis ground thus allowing the driver/driver's seat to build up a static charge. A simple ground strap from the rail of the seat frame to the truck frame as indicated in the above procedure for the on-board computer should eliminate this potential static build-up.

NOTE: The installation kit contains extra terminals, adaptors, and splices to adapt to most installations. A simple 12-volt test light is best to use for finding the power and ignition hookups.

Once the 8000's are installed and wired, perform a check of the truck's electrical system as described in the following: "Truck Electrical System Checkout Procedure"

Truck Electrical System Checkout Procedure

With the truck not running and all accessories off, measure the no-load voltage directly across the battery terminals. This voltage should be between 12.0 and 12.6 volts. A voltage reading less than 12.0 indicates a faulty battery. Replace the battery with a properly rated battery. This will insure proper operation under increasing load.

With the truck running, the voltage should read between 13.5 and 14.0 volts. This voltage should not drop significantly with all lights and accessories on. If it does, the voltage regulator or alternator may be faulty.

With the truck running and accessories on, check the voltage between the negative terminal of the battery and the frame of the truck, then between the negative and cab. If the reading is other than 0.0 with the meter on its lowest range, the truck has a faulty ground system. This can be corrected by connecting a large gauge wire or ground strap from the negative terminal to the point of the truck that registered a voltage.

NOTE: If the truck is equipped with a high power business band radio, this check should be made with the radio on and microphone keyed.

Cable Routing

Route the register cable from proximity of the register, down along the inside of the truck frame or along piping, and then into the cab. Keep away from other wiring as much as possible. Use the cable-ties supplied to secure the cable from movement and possible chaffing, and stay clear of moving parts. Where the cable must pass through a hole in sheet metal, use grommets to line the edge of the hole. The cable may run in a split loom or tubing to further protect it from weather and abrasion. Cover the connector ends with electrical tape for routing. Stow any excess cable behind or under the seat where it will be protected. Do not coil the excess, but rather gather it in figure-eight fashion and secure it in a bundle with cable ties.

Route the power cable from the power source to the computer in a similar manner as above, avoiding areas that may cause damage to the cables.

After the cables are connected to the computer and register, make sure that they are strapped in such a way that the connectors will not move in relation to their mates. Do not allow the cables to dangle from the connectors. However, make sure not to have excessive downward pressure on the cable ends as the connector locking ring will break.

Connecting Cables

The MID:COM 8000 uses 9-pin and 4-pin circular locking type connectors. To make a connection, rotate the cable end connector until the mating keys are aligned and the connectors engage. Turn the locking collar clockwise until a noticeable “CLICK” is felt as the locking detent engages. Do not use pliers or other tool.

In a single meter system, the register cable is connected to the socket labeled “REGISTER 1” on the rear of computer. The power cable mates with the socket labeled “POWER”. Refer to the 8000 Rear View Diagram for more information.

Be careful not to connect the power cable to either “Valve 1” or “Valve 2”.

NOTE:
The register end of the register cable has a heat shrink cover for added protection.

Figure 1. 8000 Back Panel Cable Connections

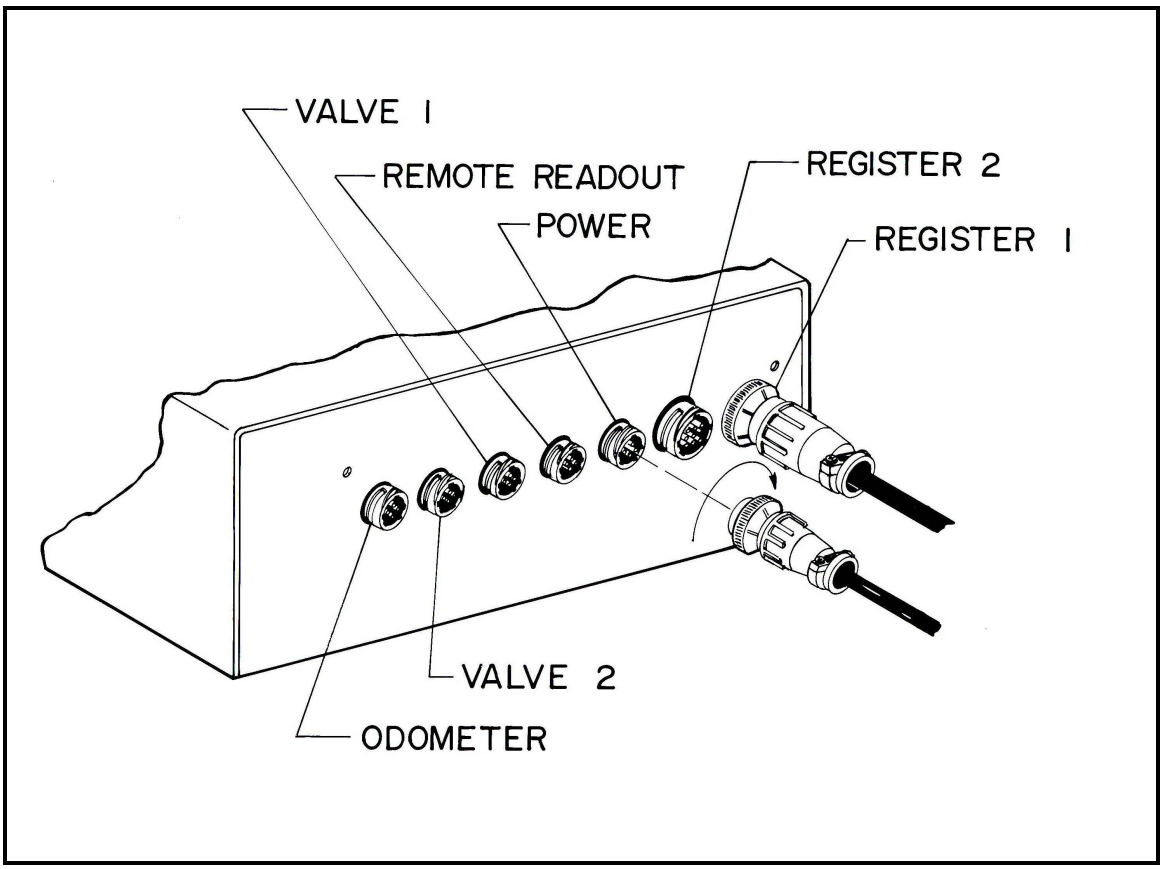


Figure 2. 8000 Back Panel Including Serial Ports

Computer Installation Checklist

1. Is the computer display clearly viewed from driver's position? If not see "Contrast Adjustment"
2. Are cables routed away from moving parts?
3. Are computer and its cables free from rubbing on items in the cab? Check seat, dash, etc.
4. Is computer securely fastened to pedestal?
5. Is pedestal securely fastened to floor of cab?
6. Are grommets in place where cables pass through sheet metal?
7. Is register head sitting squarely on meter base?
8. Is register cable connector (at register) free from excess stress?
    a. Note: it may be necessary to cut away some of the rubber boot assembly to relieve stress on connector.
9. Are spike suppressors installed on hose reel solenoid, throttle control solenoid, etc?
    a. Note: To check spike suppresser installation, with unit on and hose pulled out depress hose reel button and note that the register display does not reset or that volume is not erroneously registered on totalizer or display.
10. Check to see that computer does not interfere with radio transmissions.
    a. If excess noise is noticed, make sure register cable is configured in a figure eight. It may be necessary to move the excess cable to the outside of the cab or to the rear compartment for extreme cases of interference.
11. Check to see that keying the mike does not cause the register to reset or add volume to the totalizer or display.
    a. If this occurs you need to attach jumper across J7 in the register module.
    b. See information packet for these instructions.
12. Do a shift report to check printer line spacing.
    a. Line spacing is set at approximately 6 lines per inch from the factory.)
13. Shut the truck off. The Computer should go through a "Power Failure Sequence" prior to shutting off.
14. Are all cables installed per installation procedures? Check power, register, valve cables, etc.
15. Is the computer properly grounded?
16. Has truck's electrical system been checked out per the instructions?
17. Is the air-ride seat properly grounded?

Installing the SRG00X-X Electronic Register and Accessories

Spike Suppressor Installation

All MID:COM 8000's are shipped complete with one spike suppressor per register head, these are included in the installation kit. The spike suppressor must be installed across each hose reel solenoid – refer to the Solenoid Spike Suppressor Wiring Diagram on the next page. It also may be necessary to install more than the one on the hose reel solenoid or other spike producing components of the truck electrical or pumping system. If so, contact the factory to order additional spike suppressors.

Reel Motor Solenoid Spike Suppressor Installation

The spike suppressor is a heavy-duty diode used to kill the high-voltage inductive kickback that occurs when the reel motor switch is released and the solenoid contactor opens. The spikes that are produced can cause electrical noise interference with any type of electronic equipment.

Most solenoids are equipped with a single screw stud that is connected to one side of the coil, with the other side of the coil either grounded or connected to 12-volts. Before installing the suppressor, it's important to determine which configuration you have. A 12-volt test light works well for this.

Connect the light between the switch stud and ground. If the light does not glow at all, press the reel switch and it should light. This is a grounded coil configuration. Connect the red lead of the suppressor to the stud, and the black lead to ground.

If the light glows even dimly, press the reel switch and it should go out altogether. This is a hot coil configuration. Connect the black lead to the stud and the red lead to 12-volts (the hot side of solenoid).

If the solenoid has two studs, and both have a wire going to them, check both as described above and connect the suppressor to whichever stud reacts like the grounded coil configuration.

Figure 3. Ferrite Cylinder Clamp Installation

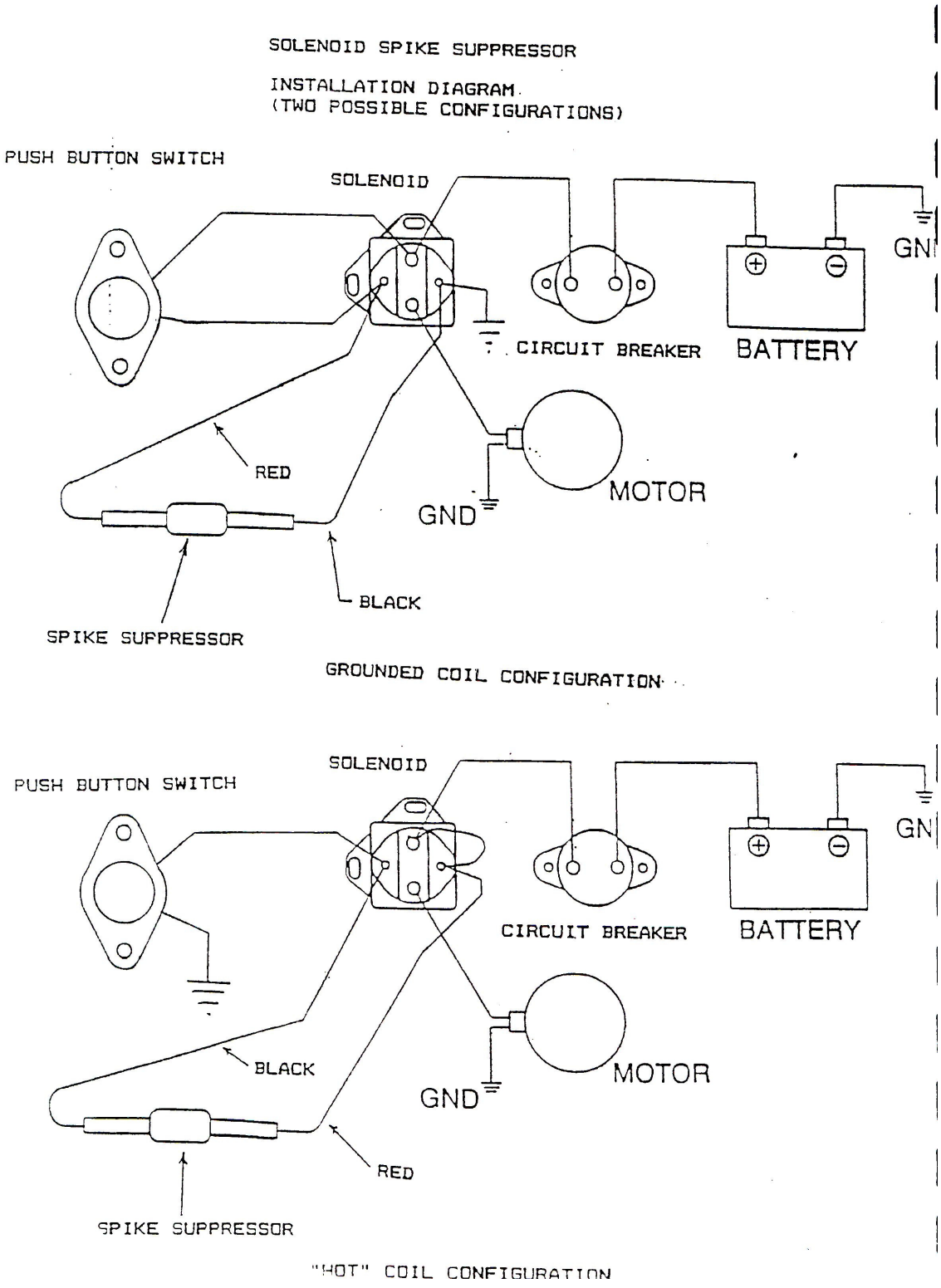
8000 COMPUTER OR EPCM

INSTALL ONE FERRITE CLAMP TO THE REGISTER CABLE AS CLOSE AS YOU CAN TO THE 9 PIN CPC CONNECTOR.

REGISTER 8000 OR ECOUNT

INSTALL ONE FERRITE CLAMP TO THE REGISTER CABLE AS CLOSE AS YOU CAN TO THE CPC CABLE ENTRY SEAL.

Figure 4. Solenoid Spike Suppressor Wiring Diagram



SV104 Valve Wiring Instructions

3 Conductor Valve Cable Connections:
Red = Connect to **Both** 1st and 2nd Stage
Black = 1st Stage Shut Down
White = 2nd Stage Shut Down

The voltage present on an individual wire is dependent on the device connected to the valve:

	E:Count Register	8000 Computer or SLS
Red Wire	Constant Ground	Constant +12 VDC
Black Wire	Switched +12 VDC	Switched Solenoid Ground
White Wire	Switched +12 VDC	Switched Solenoid Ground

Valve Connections: Red to one wire from each solenoid.

1st Stage Shut Down (Black) to solenoid
Identified on tag as #EF8016G1

2nd Stage Shut Down (White) to solenoid
Identified on tag as #EFHT8003G1

SV104 Valve Operation

Once solenoids are energized product can begin to flow. Upon reaching 1st Stage Shut Down the large valve will slowly shut down while pressure is equalized. This is a spring assisted closure. This then creates a slow flow of approximately 10 GPM. Once preset or 2nd Stage Shut Down is reached the valve will completely close.

NOTE: If Solenoids have a third wire that is green with yellow stripe, it can be cut off as it is not used.

NOTE: DO NOT USE DIODES WHEN HOOKING VALVES UP TO AN E:COUNT REGISTER.

NOTE: DIODES SHOULD BE USED WHEN WIRING IN AN EMERGENCY SHUTDOWN SWITCH.

Figure 5. SV104 2 Stage Solenoid Valve

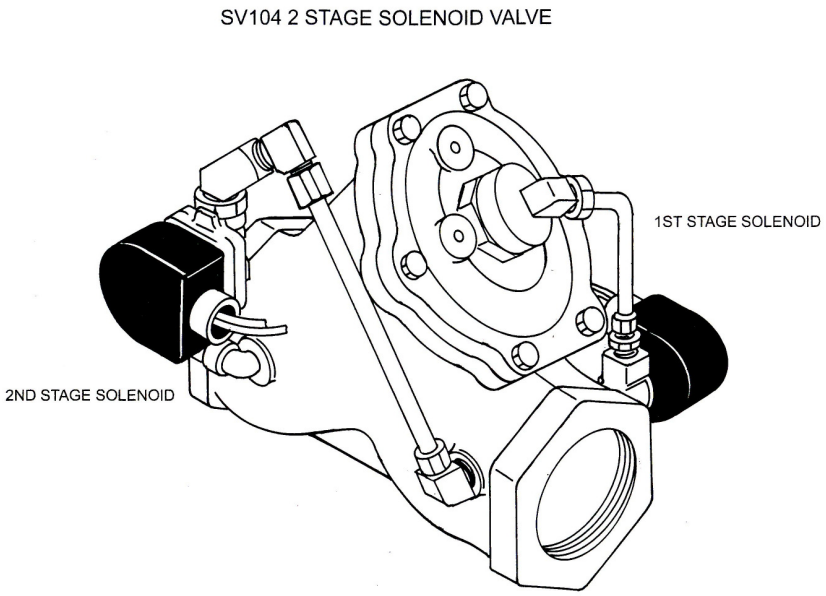
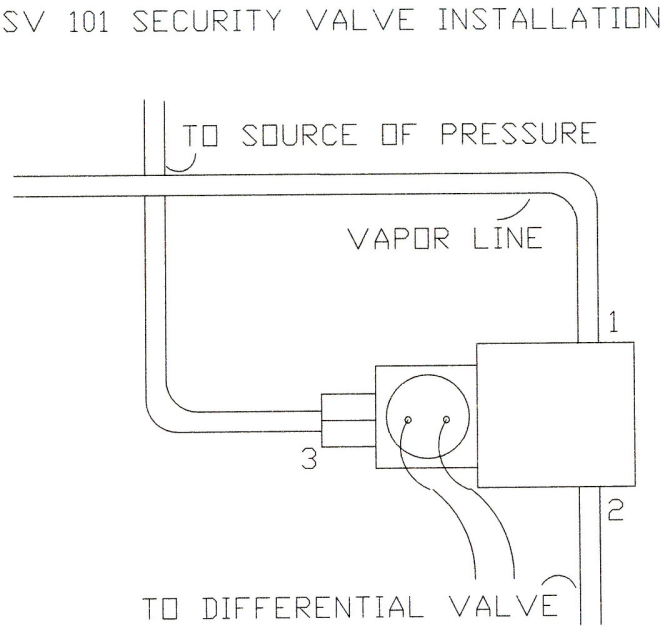


Figure 6. SV101 Security Valve Installation



SV101 Solenoid Security/Preset Valve

For Models 6501, 8000, SmartLink, and E:Count

PART NUMBER	DESCRIPTION
Valve:	
706-0006	Security valve for use with the 6501 register head, equipped with a short cable and a 2 pin nylon connector.
706-0004	Security valve for use with the 6501 computer's ticket interlock feature, equipped with a long cable and ¼ inch "microphone" plug.
706-0015	Security/Preset valve for use with the 8000 computer, equipped with a long cable and 4 position circular plastic connector.
706-0027	Security/Preset valve for use with the SmartLink "SLS" system, equipped with a short cable and 4 position circular plastic connector.
706-0045	Security/Preset valve for use with the E:Count system, equipped with a short cable and 4 position circular plastic connector.

PART NUMBER	DESCRIPTION

Wiring:

706-0006	The valve comes pre-wired to the register head if it was ordered with the 6501 system or register head. For field installation, a ½ inch N.P.T. opening must be made in the register cover to accommodate the cable's compression fitting. Route the cable through the register cover and plug the 2 pin connector onto the mating header on the right side of the headboard, just above the register cable plug. Install the compression fitting and replace the cover. Pull out any slack in the cables and tighten the fittings.
706-0004	Route the valve cable along the register cable and insert the plug into the receptacle on the rear of the computer.
706-0015	Route the valve cable along with the register cable and connect the plug to the mating receptacle labeled "VALVE 1" on the rear of the 8000 computer.
706-0027	Route the valve cable from the valve to the back of the "SLS" register and connect with mating receptacle.
706-0045	Route the valve cable from the valve to the back of the E:Count register and connect with mating receptacle.

PART NUMBER	DESCRIPTION

Plumbing:

MID:COM has supplied valves manufactured by two different companies: Asco and Parker-Skinner. Although they are functionally the same, they are constructed differently and their ports are numbered differently.

Valves No Longer Available:

ASCO P/N 832058	Green solenoid housing with three ports on main valve body. [1]
Parker-Skinner P/N X54LB2XXX	Gold solenoid housing with two ports on main valve body, and one port out the solenoid cover. [1]
Parker-Skinner P/N 714X50202A	Blue solenoid housing with three ports on the main valve body. [1 2]
Parker-Skinner P/N 7133TVN	Black solenoid housing with three ports on main valve body. [1 2]
Parker-Skinner P/N 71335SN	Black solenoid housing with two ports on the main valve body, and one out the solenoid top. [1 2]

Current Production Valve:

Parker-Skinner P/N 7139	Black solenoid housing with two ports on the main valve body, and one out the solenoid top. [2]

Notes:

1. This valve is no longer available.
2. A Repair Kit is available for this valve.

Security Valve Installation

1. Make sure the meter is blown down and safe to break pipe connections.
2. Remove the vapor line going to the differential valve.
3. Referring to the port designations below, connect the "common" port to the differential valve with a pipe nipple.
   NOTE: Fittings and hoses are user supplied.
4. Connect the vapor line to the "vapor" port.
5. Connect the "pressure" port to any source of liquid pressure upstream of the differential valve.

Security Valve Port Designations

SKINNER #X54LB	PORT 1	VAPOR	Vapor Line
	PORT 2	COMMON	Differential Valve
	PORT 3	PRESSURE	Source of Pressure
SKINNER #714X & 7133	PORT 1	VAPOR	Vapor Line
	PORT 2	COMMON	Differential Valve
	PORT 3	PRESSURE	Source of Pressure
ASCO #832058	PORT 1	COMMON	Differential Valve
	PORT 2	VAPOR	Vapor Line
	PORT 3	PRESSURE	Source of Pressure

Security Valve Operation

When the valve is de-energized, liquid pressure is ported to the differential valve holding it closed. When the valve is energized, the liquid is bled back through the vapor line and the pressure port is cut off. The meter and differential valve then operate as if the valve was not in the system.

Mounting the Register Head

The MID:COM 8000 mounts directly onto a Neptune 1-1/4" or larger meter with no adapters. All other meters use a Veeder-Root style mounting and therefore an adapter is necessary to convert from the Veeder-Root style to a Neptune configuration. MID:COM supplies three adapters for this purpose as listed below plus a fourth adapter for Neptune compensators.

MODEL VR-1
This adapter is used in the majority of conversions. It will accept all Veeder-Root gear-plates that are used in conjunction with a mechanical preset mechanism.

MODEL VR-2
This adapter requires no gear-plate and is specifically designed for Smith meters that use a yoke style coupling and output 1 revolution per gallon.

MODEL VR-3
This adapter accepts a straight through drive from gear-plates that are used with a preset and have a 10:1 turn-down ratio from the meter to the preset.

MODEL VR-4
This adapter is required when mounting to a Neptune meter with a mechanical temperature compensator. The VR-4 adapter is mounted in place of the mechanical temperature compensator assembly.

The VR adapters may be converted from one to another with the proper kits available from the factory. Instructions for using the particular adapter are included with each kit.

Mount the register to the meter or adapter by lowering it down onto the vertical-mounting studs. The drive yoke in the register and the star drive on the meter must mate properly as the register is mounted. Moving the register back and forth and side to side will aid in alignment.

Once the register is seated properly, tighten the two tie-down bolts finger tight. Wrench tighten approximately one more turn. Check to see that the register will not rock back and forth. If it does, the top of the meter is probably warped and it is necessary that a shim be installed between the meter and register to level the surface.

VR-1 Adapter

The gear plate from the Veeder Root register must be used with this VR-1 Adapter.

Modify the gear plate by removing and discarding the bevel tooth gear. Also remove the 25-tooth brass gear and replace with the 39-tooth gear that is attached to the adapter.

Secure gear to VR-1 Adapter using same gear plate mounting screws.

Figure 7. VR1 Adapter

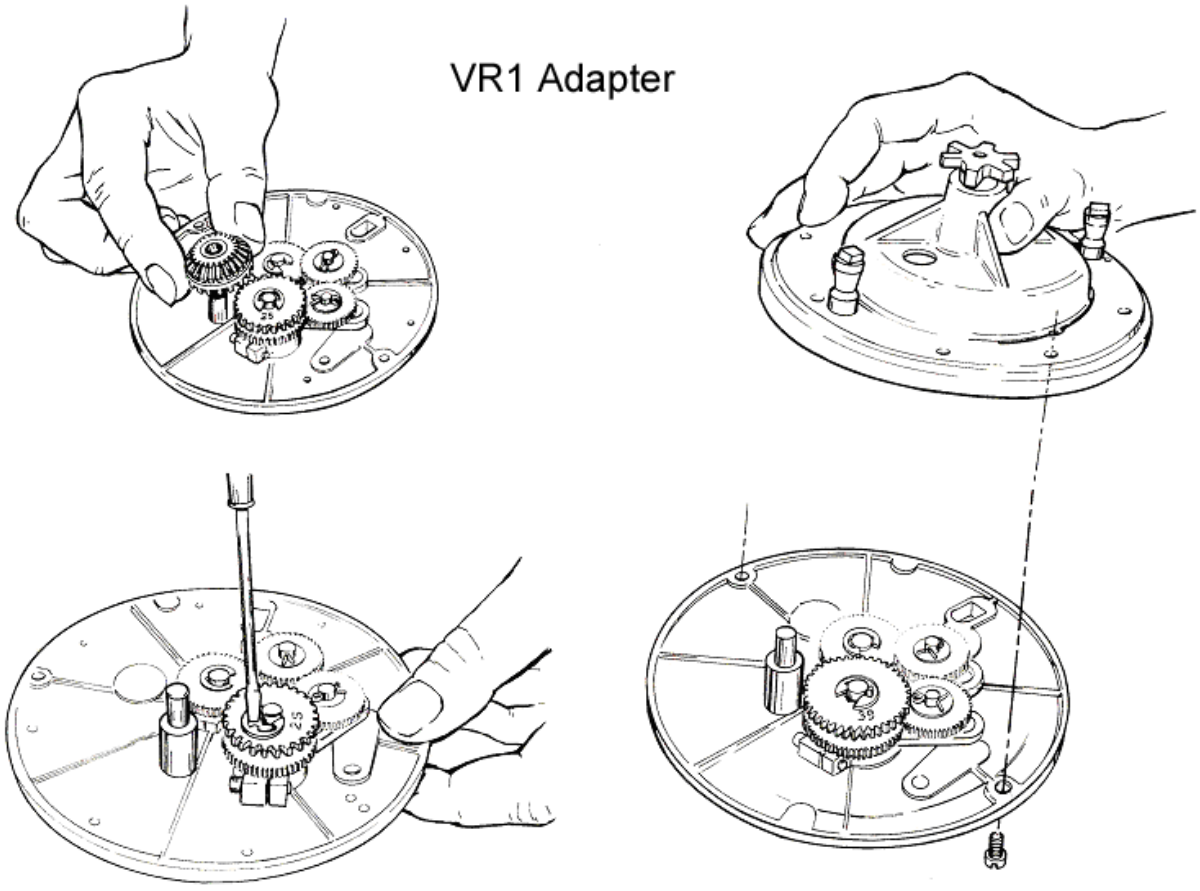


Figure 8. VR4 Adapter

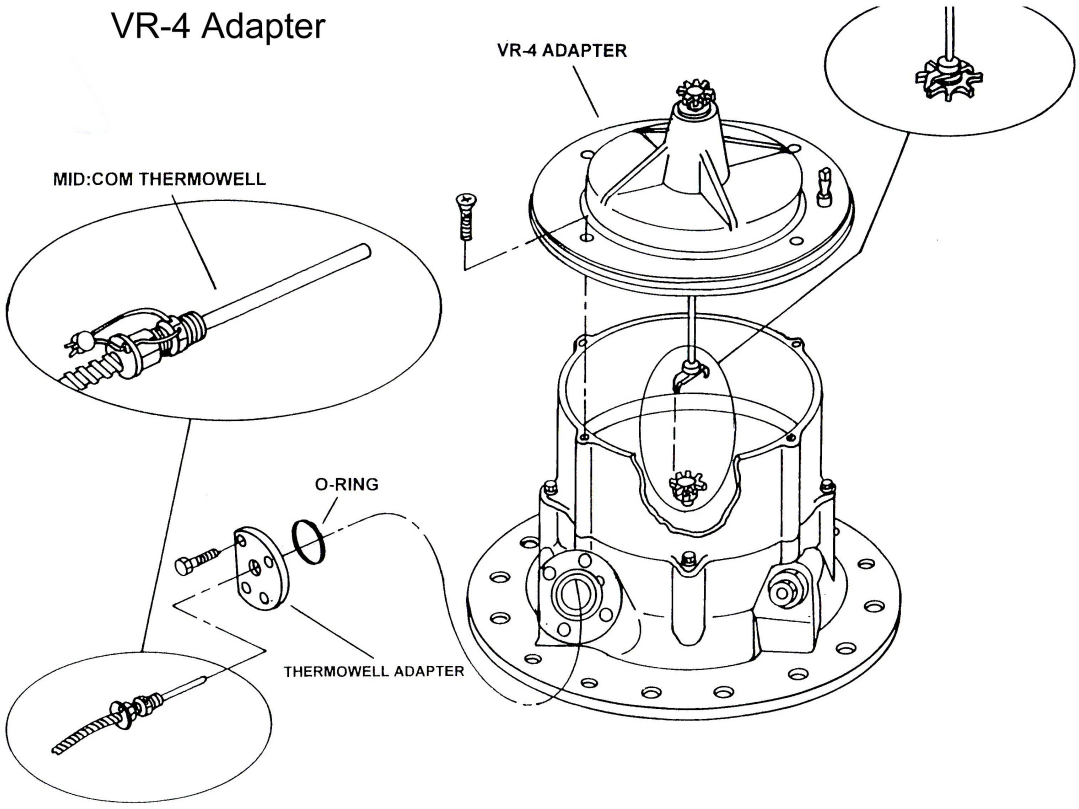
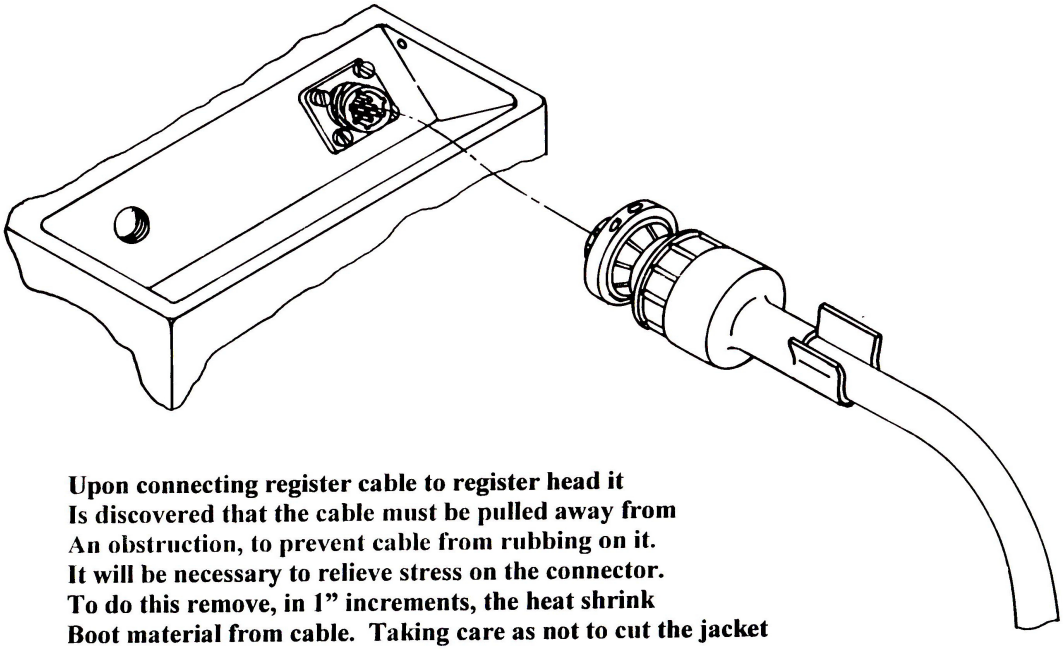


Figure 9. Register Cable Stress Relief



Upon connecting register cable to register head it Is discovered that the cable must be pulled away from An obstruction, to prevent cable from rubbing on it. It will be necessary to relieve stress on the connector. To do this remove, in 1" increments, the heat shrink Boot material from cable. Taking care as not to cut the jacket of the cable.

Section 2 – MID:COM 8000 Operating Instructions

8000 General Rules and Operating Procedure

The MID:COM 8000 uses a 22 key keyboard and 4 line alphanumeric display for operator control. Although the system is basically menu driven, prompting the operator for input, certain operations are particular to the 8000 and must be thoroughly understood for ease of operation.

The operator is prompted through the various modes of operation by a series of “screens” on the display screen. Any of the four lines in each screen may contain Operation selections or Customer/Delivery information.

To the left of the screen are four (4) “line keys” which point to one of the four lines on the display. The line keys are used to select the function shown in that particular line or are used to change the information that appears there. If the function can be selected or the information changed, a left arrow will appear as the first character in the line and points to the corresponding “active” line key. If the selection is not allowed at the time, the arrow will not appear and the line key will do nothing.

Movement between screens is accomplished two ways depending on what the operator is doing at the time. The screens can be thought of as being a vertical “stack”. Screens are accessed before a delivery is made and to initiate printing of the ticket. In some cases, he may need to move up through the screens as in searching for a customer record. This is done by using the up-arrow and down-arrow keys in the center of the keyboard. If the arrow keys are allowed for use, one or both will appear in the lower right corner of the screen, directing the operator as to which way to go. The other method of movement through the screens is simply selecting a function. Once selected, the function will either be performed or another screen may appear waiting for further input. In a normal delivery, a combination of the two methods is used and additional screens may appear showing the operator what the unit is doing at the time.

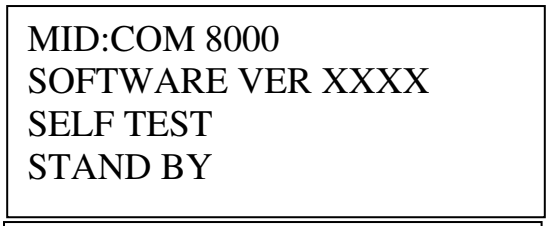
At times, the operator will have to input new prices, taxes, preset volumes, etc. The method of entry the 8000 uses is called S.E.A., which is an abbreviation for “select-enter-accept”. This is unique to the 8000 and must be understood completely. For example, to enter a new price, the operator presses the line key pointing to the price on the display. A blinking cursor will then appear over the first or leftmost digit of the price. Simply enter the new amount one digit at a time and the cursor will move to the right with each entry. Entering a decimal point in the number is not necessary since the decimals are fixed and the cursor will jump over it. Also, it is only necessary to enter digits up to the last one that needed to be changed. After this, the operator presses the line key again and the entry is accepted and the cursor disappears. All entries are made in this manner and it is important to note that while a cursor appears anywhere in the screen, no other function of the unit is available. The operator must extinguish the cursor by accepting the entry before going on. If an error is made during the entry and the line key was pressed to accept it, just press the line key again and start over. If the cursor is still blinking, simply continue to enter digits and the cursor will “wrap around” back to the first digit.

One very important key is the one-labeled start/stop. When this key is pressed, the 8000 will cancel the current screen and go back to a previous screen or all the way back to the main menu. Its main purpose is to get quickly back to the main menu no matter where you are in the operation of the 8000. In some cases, it may have to be pressed more than once. The only times it will not function is when a cursor is showing on the screen as explained above, or while volume is being delivered.

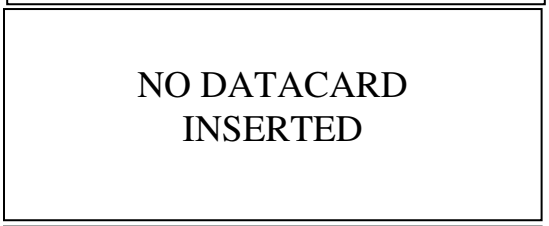
8000 Startup

The following example illustrates the first three (3) screens that the operator encounters after starting the truck:

[SCREEN 1]

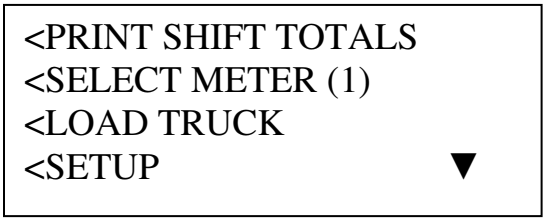


[SCREEN 2]



[SCREEN 3]

[MAIN MENU]



The first screens appear automatically after power-up while the 8000 performs a test of its hardware. The "Main Menu" screen is the screen from which all other functions are chosen.

There are 5 major functions of the 8000. Four of these are shown in the Main Menu and are chosen by pressing the appropriate line key. These functions are done only periodically. The fifth major function which is done routinely is making a delivery.

To get into the screens that prompt the operator through a delivery, the down-arrow key is pressed as indicated by the down arrow symbol ▼ in the lower right corner of the Main Menu. The 5 major functions are discussed separately in the following sections.

8000 Function 1 – Printing Shift Totals

When "Print Shift Totals" is selected, the operator will be prompted to insert a blank ticket. Once the ticket is inserted to its full depth, the 8000 will begin printing the current shift total information which includes the following:

1. Time and date of previous shift printout.
2. Current time and date.
3. Totalizer
4. Truck number.
5. Driver number.
6. Plant number.
7. Total gallons delivered since last print out.
8. Total dollars billed since last printout.
9. Total money received on account since last printout.
10. Current quantity of product on board.

When using an E:Count Register the Shift Totals will print on 2 tickets.

The shift totals are mainly for delivery reference and are not intended to be very detailed. The information returned to the office on the datacard can be processed by the office computer for very detailed reports. After the printout is complete the 8000 will return to the main menu.

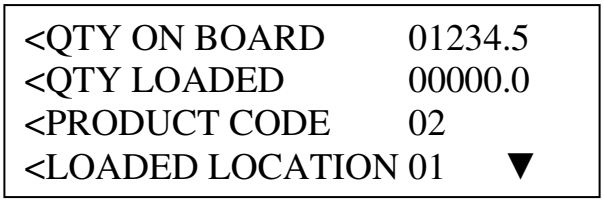
8000 Function 2 – Select Meter

Select meter is only used where the truck has two meters and two register heads are connected to the 8000 computer. Selecting "Select Meter" will change the meter number shown in parentheses from (1) to (2) or (2) to (1) each time line 2 key is pressed. The correct meter must be selected before the delivery is made. The Meter Number must also be correct before entering setup since some of the setup functions are unique to each meter.

Note: Selecting meter (1) will only activate register (1). Selecting meter (2) will only activate register (2).

8000 Function 3 – Load Truck

When the "Load Truck" function is selected, the following screen will appear:



If using the E:Count, the Product Code must be a code that is already calibrated in the E:Count. "Invalid Product Code" will be displayed if the product is not calibrated.

The operator may enter new numbers for any of the lines listed above. The quantity on board is automatically decreased by the amount of each delivery and will be increased by the amount entered into quantity loaded. Normally, the quantity on board needs to be manually entered only to adjust to the actual amount on board in the event that a prior load had not been entered; or when initially setting up the 8000. Quantity loaded will initially come up with 00000.0, while product code and load location will be retained from the last load operation. If a datacard is being used, the information will be written to the card. If a card is not used, the quantity on board is still updated. Pressing the down-arrow as indicated or the start/stop key will return the operator to the main screen.

8000 Function 4 – Setup

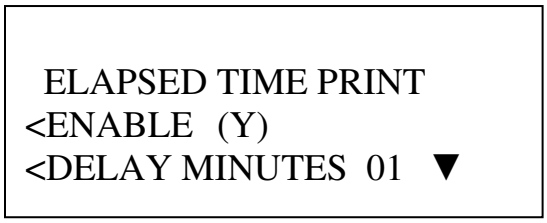
Selecting "Setup" places the operator in a set of screens used to configure the 8000 for how it will be used, set the clock, enable discounts, etc. Setup is required when the machine is installed and periodically when such things as daylight savings time may require the clock to be reset. The screens in "Setup" are shown and explained below. The operator may arrow-down through the screens, change what is necessary, and then press start/stop to return to the main menu. The first screen that appears after pressing "Setup" is:

<DRIVER NUMBER 0000
ADDITIONAL SETUP
REQUIRES ACCESS CODE
<ENTER #_____

This screen allows the operator to enter the driver number that may change from time to time. Further access to the setup procedures is not allowed except with the proper access code. When the 8000 leaves the factory, the code is programmed as 000000. Entering 000000 will allow access to the screens below. One part of this setup procedure will allow the 000000 code to be changed to any other 6 digit number, however, **it is important to remember the new number.** Once the access code is entered, this next screen will appear:

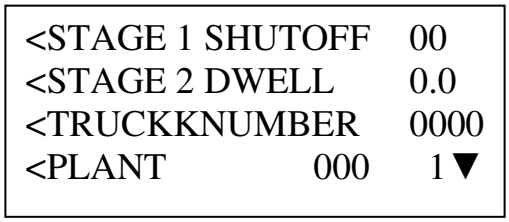
<TIME 14:20:34 ▼
<DATE 08/01/99
<SALES NO. 000025
<NEW ACCESS #_____

Enter the current time and date (MM/DD/YY) ignoring the colons and slashes. The cursor will jump over them. Time is military format. I.E. 14:20 = 2:20 PM. The sales number is the next sequence number to be printed on the delivery ticket. It may be reset to zero, or to any starting number entered. A new access number may also be entered here but remember that once leaving setup, this number is the only way to get back in. It's wise to use a number such as a birthday to remember it. As indicated by the ▼, down-arrow will move to the next setup screen.



The elapsed time print feature causes the ticket to be automatically printed after a number of minutes have elapsed since product flow stopped. To enable or disable this feature, simply press the line 3 key to change it from N to Y. Enter the delay in minutes from 1 to 30 in line 4. Pressing down-arrow will move to this next screen:

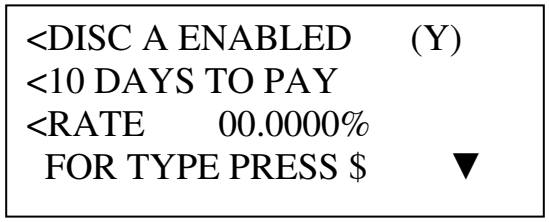
Note: In Canada this feature is "hard coded" to Y and a max of 3 minutes per W&M regulations.

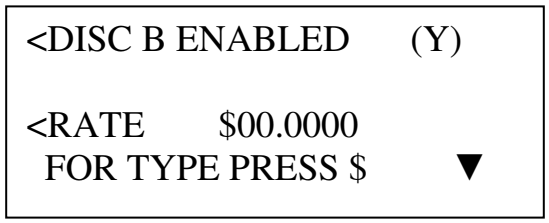


If using the E:Count, the shutoff and dwell values are not used as the valves are controlled by the E:Count.

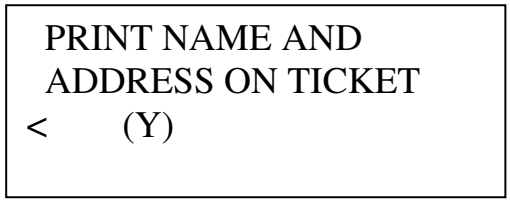
The first two lines of this screen are used to set valve closures when a preset solenoid valve is used in the system. Stage 1 shutoff is the number of units preceding final shutdown that the first stage valve is shut for the first time slowing flow into the second stage. Stage 2 dwell is the number of units and tenths of units preceding the final shutdown that the second stage valve closes for the second time. Stage 1 shutoff usually ranges from 3-60 units. Stage 2 dwell may have to be periodically adjusted to compensate for a change in product viscosity. If the meter is set up for single stage operation then stage 1 shutoff should be set at 00 and only stage 2 dwell used.

Enter truck number, plant number, and meter number and then use the down-arrow to get to these next two screens.

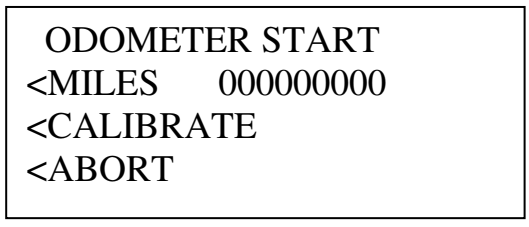




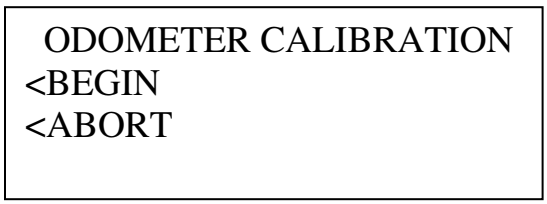
These two screens allow the operator to enable or disable the two types of discounts allowed by the 8000 as well as determine the rate and pay time. Refer to the document that covers taxes and discounts for further explanation of how the discounts are applied and calculated. The discount setups here apply to all deliveries made without the use of a datacard. Therefore, if either or both of the discounts are enabled, they cannot be selectively disabled for any particular delivery without going back into setup. When a datacard is being used, the customer record contains discount information which overrides the setup information and therefore each delivery may be unique in discount structure. A down-arrow from here will produce the next screen.



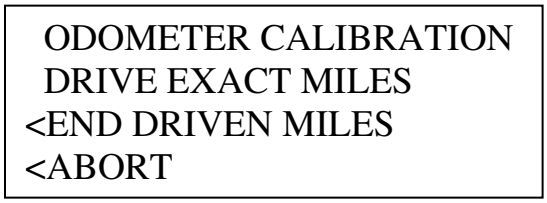
In this screen, you may select whether or not the name and address will be printed on the ticket by pressing the line 3 key to change it from Y to N, or N to Y. If “No” is selected, the first line of the printout will be the customer account number. A down-arrow from here will produce the next screen for calibrating the odometer sensor, an optional accessory.



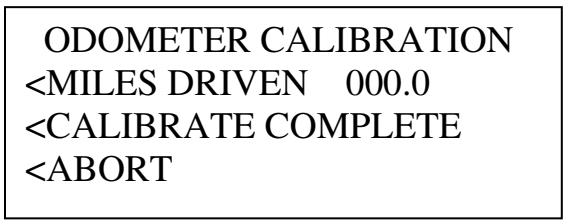
Miles (or kilometers) shows the current mileage on the truck. A new number may be entered here to correspond with the actual mileage on the truck. The mileage figure is updated as the truck is driven. Because the sensor does not distinguish between forward and reverse, there is an inherent forward "creep" for this reading when compared to the actual odometer. "Abort" will leave this screen and return to the main menu or press start/stop. Selecting "calibrate" will bring the operator to this next screen:



Before selecting "begin" to start the calibration procedure, the operator should note the truck's odometer reading. To insure an accurate calibration, it's best to start with all numbers in an even position in the odometer window. Also, note whether the reading is in whole units or tenths. Press "begin" for the next screen.



While this screen is showing, drive the truck at least two miles (or 4 kilometers) and try to stop the truck with the odometer digits in an even position in the odometer window. Note the exact odometer reading once again and then press "end driven miles (or kilometers)". This will bring us to the last screen.



Subtract the beginning odometer reading from the last and enter the difference in “miles (or kilometers) driven”. Be careful to note the position of the decimal point. When accepted, press “calibrate complete” to exit and return to the main screen. At this point, all setup has been complete.

8000 Function 5 – Loading the Tax Code Information

Besides entering and using single tax rates explained in the following sections, the 8000 can accept and use multiple tax codes. Refer to the documents covering tax and discount calculations as well as the programmers guide for detailed information on this.

The tax code information needs to be loaded at the time of setup or whenever tax rates change. To load the information, plug in the “master tax datacard” into the 8000 before it is turned on, and then power the unit up. Once the 8000 has passed through the self-test screens and the tax codes have been loaded, the 800 will display ”Please Remove Card Now” – the tax data has been loaded and the tax datacard can be removed.

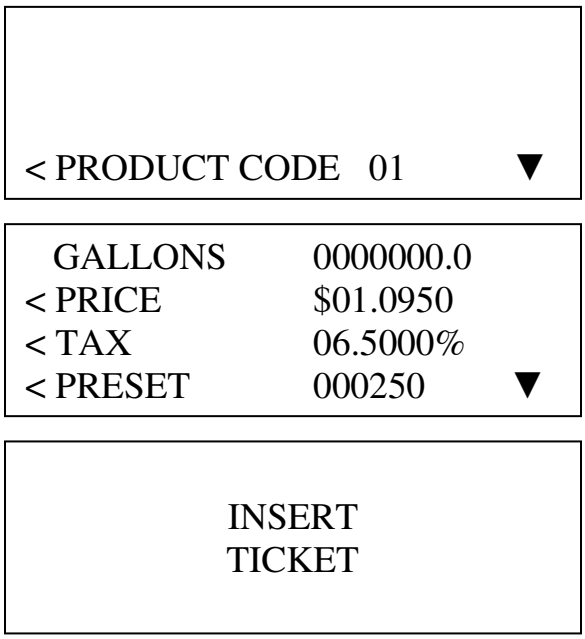
8000 Function 6 – Making a Delivery without a Datacard

From the main menu, press the down-arrow key.

If using the E:Count, the Product Code of the previous delivery must be valid or else “Invalid Product Code” displays.

All four lines of the screen will show the values from the previous delivery. Therefore, if the information does not have to be changed, the operator simply presses the down-arrow key and he will be prompted to insert the delivery ticket and begin the delivery. Changing price and preset can be done directly from this screen. If tax is selected, the operator is given a tax screen to make the tax changes.

Product Code Screen is only Displayed when Using E:Count Register



Short-cut Delivery

Delivery with a Datacard

1. Insert the customer Datacard in the slot marked DATACARD before starting the truck or while in main menu.
2. Select ▼ from the main menu.
3. Select either SCAN ACCOUNTS or ENTER ACCOUNT NUMBER with corresponding Line Key button.
4. If SCAN ACCOUNTS, use ▼ to find the account on the card.
5. If ENTER ACCOUNT NUMBER was selected, enter the account number using the number keys.
6. The account will come up to the screen, and can be selected using the Line 1 Key.
7. If using the E:Count
   a. Select ▼ to Product Code screen.
   b. Use Line 3 & Keypad to select Product Code if needed.
   c. Select ▼ to Price and Tax screen.
8. Make any changes to price, tax, or preset if needed.
9. Select ▼ and insert the ticket.
10. Make delivery.
11. Press any key.
12. Make any changes to price or tax if needed.
13. Press PRINT or press DISC if discount applies.
14. Ticket prints and ROA screen is displayed .
15. Enter R.O.A., Percent Full, Alert Code and Tank Number if necessary.
16. Press START/STOP to return to MAIN MENU.

Delivery without a Datacard:

1. Select ▼ from the Main menu.
2. If using the E:Count
   a. Select ▼ to Product Code screen.
   b. Use Line 3 & Keypad to select Product Code if needed.
   c. Select ▼ to Price and Tax screen.
3. Make any changes to price, tax, or preset if needed.
4. Select ▼ and insert the ticket.
5. Make delivery.
6. Press any key.
7. Make any changes to price or tax if needed.
8. Press PRINT once.
9. Make any changes to price or tax if needed.
10. Press PRINT again or press DISC if discount applies.
11. Ticket prints and returns to MAIN MENU.

8000 Computer Register Ticket Specifications

Model MCR-80 DOT Matrix Printer

General Type: Snap set or continuous form, with or without an envelope

Copies: Maximum of 5 copies or a total thickness of 0.017”

Paper Type: Top copy – Carbonless self-contained
Remaining copies – carbonless or carbon interleave

Width: 4.0 to 5.0 inches – Printer side stops are field adjustable and factory set at 4.25 inches

Length: Minimum 4.5 inches – any length is permissible

Line Spacing: 4 to 7 lines per inch; line spacing is field adjustable and set to 6 inches at the factory, using a 3 part carbonless form. Adjustment may be necessary depending on the thickness and construction of the form

Print Type: 8 pin DOT matrix impact using reverse Double Strike

Line Length: 25 characters maximum, occupying 3 inches in width

# of Lines: 16 to 20 maximum depending on line spacing. Printer is adjustable for insert depth. The first line of print will occur 3.5 inches from the insertion edge of the ticket with the depth set to maximum.
The number of lines may vary from one delivery to another depending on how the 8000 is used and number of taxes calculated.

Construction: Ticket must be glued on the insertion edge. On continuous form tickets the sprocket stub may be removed but does not have to be if the maximum number of lines will not be printed. It is preferable to also glue the opposite end of the ticket, or at least provide solid crimp to keep the copies together.

Cautions: It is very important to have no discontinuities in form thickness in the print area. All parts of the form need to bound at the insertion edge. If the ticket uses an envelope, the edge of the envelope or a strip for the envelope cannot be present in the print area. Perforations on any parts of the form are also prohibited in the print area.

Failure to observe these cautions may cause ticket tearing and printer problems, and void warranties.

Printer Model MCR-80 Adjustments

The MCR-80 Printer is adjustable for ticket width, ticket depth, and vertical line spacing. Unless otherwise specified, the factory settings are for a 4-1/4 inch wide ticket, depth as described below, and line spacing of 6 lines per inches. To re-adjust the printer, refer to the instructions below and illustrations accompanying this document.

Printer Ticket Width

Adjustment is made by moving the right and left ticket guides in or out. The guides are located on either side and between the two halves of the ticket tray. Two Allen head screws in the front and two in the back hold the guides and clamp the assembly together. Loosen the screws and move the guide as necessary to accommodate the ticket with about 1/16-inch side clearance. Make sure the guides are parallel to each other and also with the edge of the ticket tray. It is recommended that the guides be of equal distance from the outside edge of ticket tray.

The ticket should be inserted fully into the printer when making this adjustment. To release the ticket clamp, pull up on the bent rod on the left side of the printer.

When the adjustment is complete, the screws should be tight and the ticket should move freely in and out of the slot with the ticket clamp released. If any bind at all is noted, the guides are not adjusted correctly.

Printer Ticket Depth

The depth the ticket can be inserted into the printer determines where the first or top line of print will occur. Adjustment is made by removing the printer from the unit, loosening the two screws and sliding the stop switch plate in or out. A metal tang on the switch acts as both the ticket stop and as the sensor to tell the computer to clamp the ticket. As the ticket plate is slid from minimum to maximum depth it will encounter an obstacle at the clamp shaft and again at the back edge of the ticket tray. Removing the other four screws on the bottom of the printer will allow the base to be picked up so the switch tang can be moved to the other side of the shaft or ticket tray. If you must move the switch inside the printer, you must remove the spacers that the switch is resting on otherwise the tang may

get hung up upon inserting a ticket. Also if the spacers are removed you must attach the switch to the switch plate with different screws (4-40 X ½ BDSLMS). If the switch tang is to be positioned near the shaft or the back of the tray, make sure the ticket will fully depress the tang until it bottoms on the switch housing. After tightening the screws, insure again the switch tang travels freely, does not bind on the edge of the slot in the ticket tray and it is fully depressed when the ticket is inserted.

NOTE: The obstacles above create 2 areas on the ticket where the top edge of the top line cannot start. These are from 1.5 and 2.75 – 3.1 inches from the insertion edge of the ticket.

Printer Line Spacing

The space between lines may be adjusted to expand or compress the printout. Although set to 6 lines per inch at the factory, ticket thickness and construction, as well as system voltage will affect the spacing.

Refer to Figure 32 (later in this document) for a diagram explaining how to adjust the line spacing.

Figure 10. Part Diagram for the 8000 Computer

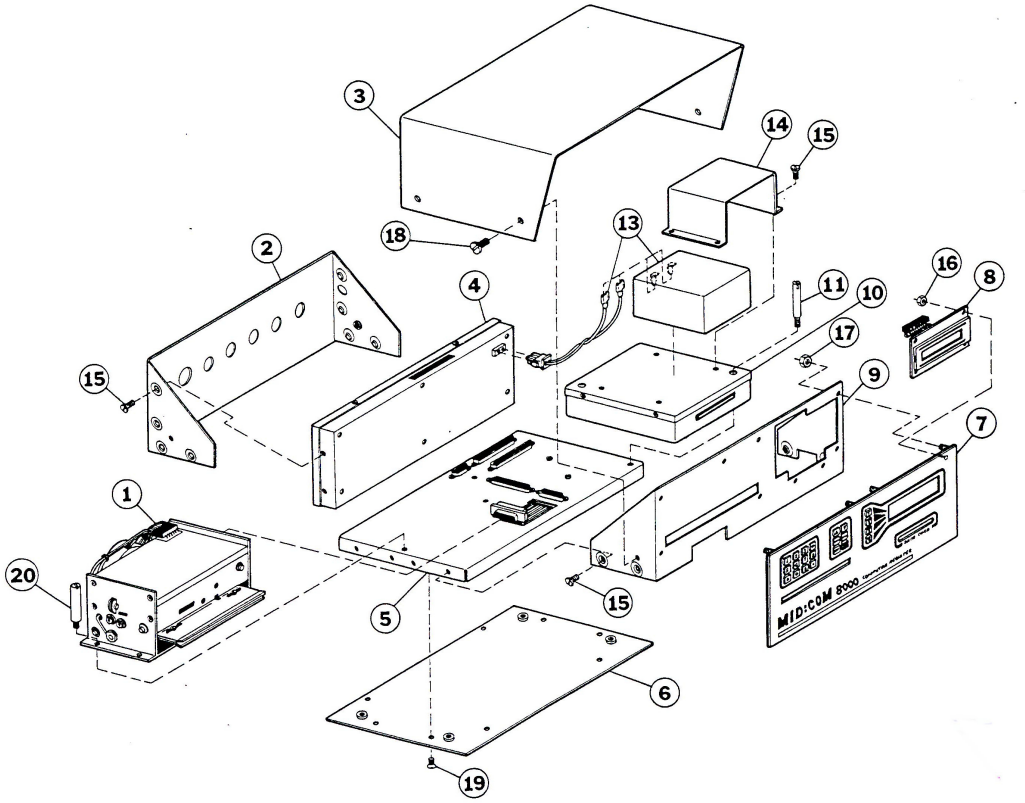


Figure 11. Part Numbers for the 8000 Computer

Item #	MID:COM Part#	Description
1	706-0002	8000 printer assembly
2	201-0026	8000 back panel
3	201-0029	8000 computer cover
4	707-0006A	8000 power module
5	709-0003	8000 chassis assembly
6	201-0034	8000 base plate
7	706-0008	8000 keyboard assembly
8	707-0005	8000 display module
9	201-0025	8000 front panel
10	707-0007 A or SD	8000 CPU module
11	300-0085	6-32 X 2.15 CPU MTG screw
13	706-0009	8000 battery assembly
14	201-0048	battery bracket
15	300-0030	6-32 X 1/4 black screw
16	300-0002	2-56 X 3/16 screw
17	301-0001	6-32 Nut
18	300-0065	8-32 x 1/4 black screw
19	300-0006	6-32 x 5/16 screw flat hex
20	300-0020	6-32 slotted printer MTG screw

Figure 12. Part Diagram for the 8000 Register

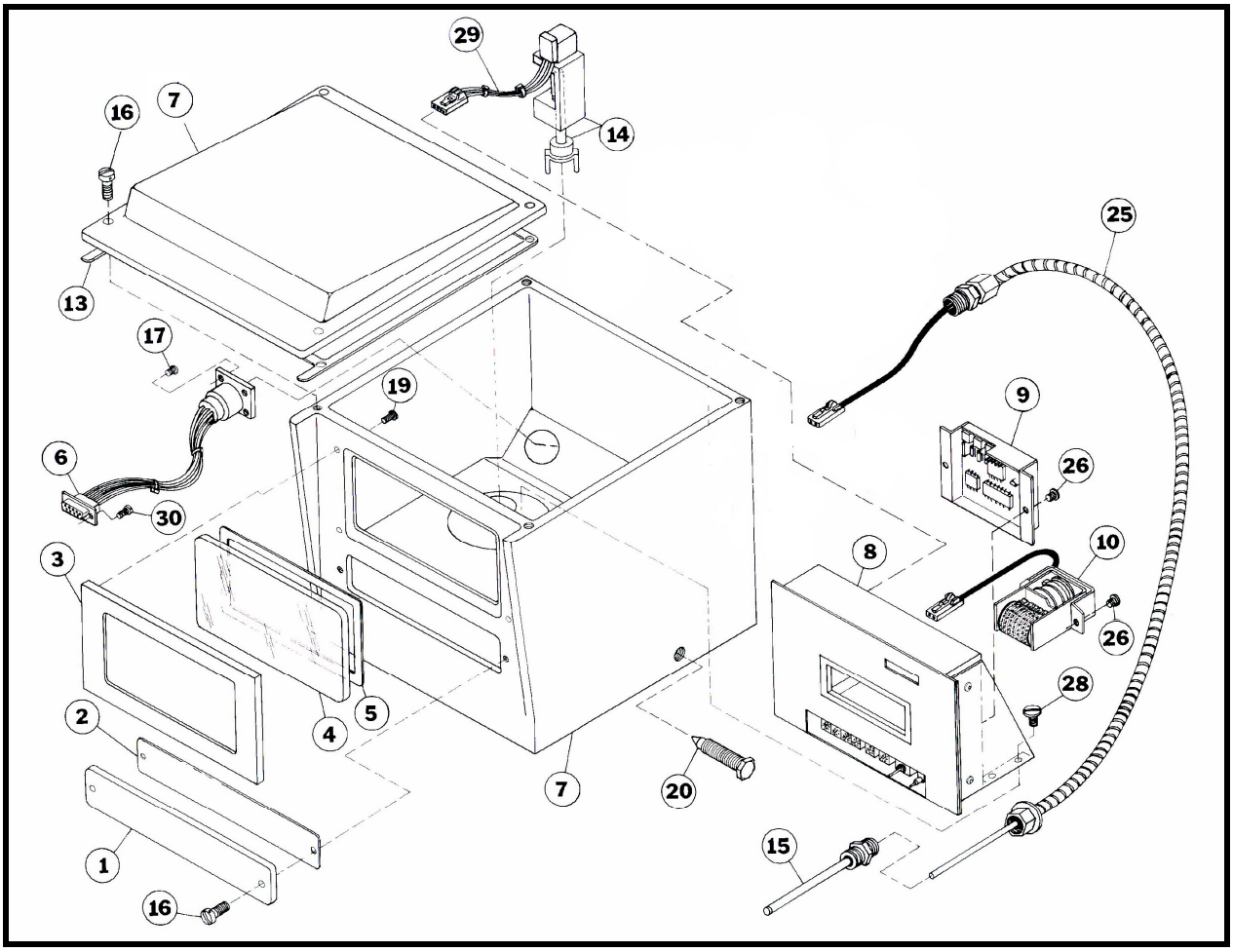


Figure 13. Part Numbers for the 8000 Register

Item #	MID:COM Part #	Description
1	705-0055	register calibration cover
2	206-0004	calibration gasket
3	202-0037	register bezel
4	202-0034	register lens
5	206-0003	register lens gasket
6	701-0001	register harness
7	200-0001	8000 casting
8	707-0004	register module
9	707-0008	temperature compensator module
10	701-0035	totalizer assembly
13	206-0002	register cover gasket
14	712-0004	encoder bracket
15	705-0021	8000 thermowell assembly
16	300-0084	10-32 X 5/8 seal screw
17	300-0051	4-40 X 1/2 screw
19	300-0023	6-32 X 1/2 pan head screw x 1/2
20	202-0006	register mounting bolt
25	701-0049	temperature comp. probe assy.
26	300-0043	6-32 X 3/16 screw
28	300-0056	8-32 X 3/8 screw
29	800-0001	rotary encoder
30	300-0049	4-40 X 3/16 screw
31	705-0012	Drive Fork Assembly

Section 3 – MID:COM SRGXXX-X Register Calibration

Calibration of the MID:COM SRGXXX-X register is done in the register head using numerically encoded switches. See the accompanying section describing the register module and calibration procedures.

The register leaves the factory with a calibrator setting of 1.000, which equates to a 1:1 ratio. When replacing an existing Veeder-Root register be sure to transfer any necessary gear plate from the register. This includes Liquid Controls or other meters with external gearing. With the proper adaptor and gear plate in place, the star gear output is one revolution equals one gallon. Installing our register set at 1.000 means it will duplicate the calibration of the mechanical register.

If a Neptune or Lockheed register head was replaced note the number of the change-gears on the bottom of the register and use the example in the calibration procedure to set in the correct factor. A change-gear chart is included for reference.

Figure 14. Mechanical Register Calibration Comparison

Mechanical Register Calibration Factor Settings

CHANGE GEARS		MID:COM CAL. SETTINGS	CHANGE GEARS		MID:COM CAL. SETTINGS
REG. SPIN	S.B. SPIN	S1,2,3,4 (Gallons) S6,1,2,3,4 (Liters)	REG. SPIN	S.B. SPIN	S1,2,3,4 (Gallons) S6,1,2,3,4 (Liters)
29	33	1.1379	33	35	1.0606
30	34	1.1333	34	36	1.0588
24	27	1.1250	18	19	1.0556
25	28	1.1200	19	20	1.0526
26	29	1.1154	20	21	1.0500
17	27	1.1111	21	22	1.0476
28	31	1.1071	22	23	1.0455
29	32	1.1035	23	24	1.0435
30	33	1.1000	24	25	1.0417
32	35	1.0938	25	26	1.0400
23	25	1.0870	26	27	1.0385
24	26	1.0833	27	28	1.0370
25	27	1.0800	28	29	1.0357
26	28	1.0769	29	30	1.0345
27	29	1.0741	30	31	1.0333
28	30	1.0714	32	33	1.0313
29	31	1.0690	35	36	1.0286
30	32	1.0667	33	33	1.0000
31	33	1.0645			
32	34	1.0625			

Neptune Measuring Chamber Wear

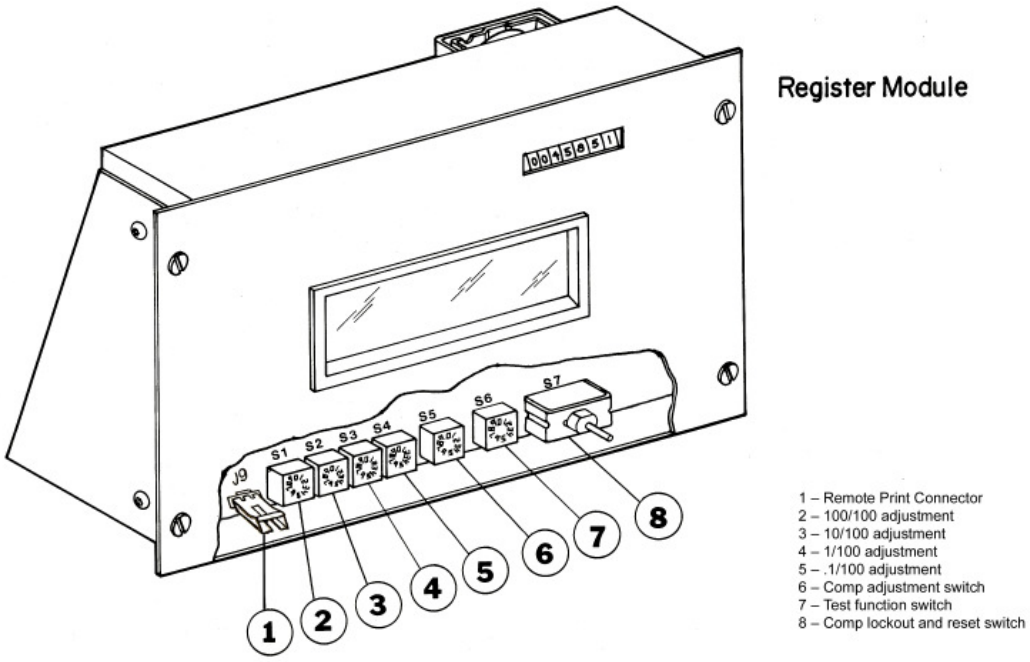
Neptune recommends replacement of the measuring chamber at 3% wear.

For Gallons round the last 2 digits:

EXAMPLE: 33 DIVIDED BY 31 = 1.0645 (LITERS) 1.065 (GALLONS)

8000 Register Module

Figure 15. 8000 Register Module



Switch Description and Calibration Instructions Used For Register Models SRG OXX-X

Switches 1-4 (S1-S4) Meter Calibration Factor
Range: 0.000 - 1.999 (000.0 to 199.9% of un-calibrated reading)

SWITCH #		Amount of change for each switch position
S4	=	00.1 Units per hundred
S3	=	01.0 Units per hundred
S2	=	10.0 Units per hundred
S1	=	Calibrate above or below a 1:1 ratio, set to 0 or 1.

***** To register more on the register, adjust switches to higher number. *****

Switch 5 (S5) Temperature Compensator Adjustment
Range: Approx. +1.5°F, -1.8°F (+.8°C, -1.0°C), Midrange setting is 5.
Each increment of the switch from **5 toward 0** adjusts the temperature .4°F (.2°C) toward a **colder** temperature or higher comp factor.
Each increment of the switch from **5 toward 9** adjusts the temperature .4°F (.2°C) toward a **warmer** temperature or lower comp factor.

Switch 6 (S6) Test Functions
Set switch to desired test and reset register with Switch 7 (to the right)

Setting 0	=	Normal operating mode.
Setting 1	=	Pulser test - bypass computations on raw pulses
Setting 2	=	Switch test - Display S1 to S6 two digits at a time
Setting 3	=	Compensated product code (by volume correction table) 1=propane, 2=fuel oil, 3=gasoline, 4=kerosene
Setting 4	=	Temperature in degrees C - see Note 1
Setting 5	=	Temperature in degrees F - see Note 1
Setting 6	=	Volume correction factor for temperature - see Note 2
Setting 7	=	A/D converter value for temperature
Setting 8, 9	=	Not used

Note 1: Displayed temperatures are negative when reading switches back and forth from 0.0 to the actual temperature.

Note 2: Format X.XXXX - "1" must be added for factors greater than .9999 (that is, for 60°F or 15°C.

NOTE 3: SWITCH 6 MUST BE RESET TO 0 FOR NORMAL OPERATION

Switch 7 (S7) Gross/Net Display Selection / Register Reset

Switch Centered	Net (compensated) volume displayed - Note 4
Switch Left	Gross (uncompensated) volume displayed
Switch Right	Momentary - resets register

Note 4: If a compensator is not installed, the gross volume is displayed in either switch setting.

Switch Description and Calibration Instructions Used For Register Models SRL 001-X

Switches 1-4 (S1-S4) Meter Calibration Factor

Range: 0.000 - 1.999 (000.0 to 199.9% of un-calibrated reading)

SWITCH #		Amount of change for each switch position
S4	=	00.01 Units per hundred
S3	=	00.10 Units per hundred
S2	=	01.00 Units per hundred
S1	=	10.00 Units per hundred
S6	=	Calibrate above or below a 1:1 ratio, set to 0 or 1.

***** To register more on the register, adjust switches to higher number. *****

Switch 5 (S5) Temperature Compensator Adjustment

Range: Approx. +1.5°F, -1.8°F (+.8°C, -1.0°C), Midrange setting is 5.
Each increment of the switch from **5 toward 0** adjusts the temperature .4°F (.2°C) toward a **colder** temperature or higher comp factor.
Each increment of the switch from **5 toward 9** adjusts the temperature .4°F (.2°C) toward a **warmer** temperature or lower comp factor.

Switch 6 (S6) Test Functions

Set switch to desired test and reset register with Switch 7 (to the right)

Setting 0	=	Normal operating mode, Calibration Factor is 0.XXXX
Setting 1	=	Normal operating mode, Calibration Factor is 1.XXXX
Setting 2	=	Pulser test - bypass computations on raw pulses
Setting 3	=	Switch test - Display S1 to S6 two digits at a time
Setting 4	=	Compensated product code (by volume correction table) 1=propane, 2=fuel oil, 3=gasoline, 4=kerosene
Setting 5	=	Temperature in degrees C - see Note 1
Setting 6	=	Temperature in degrees F - see Note 1
Setting 7	=	Volume correction factor for temperature - see Note 2
Setting 8	=	A/D converter value for temperature
Setting 9	=	Not used

Note 1: Displayed temperatures are negative when reading switches back and forth from 0.0 to the actual temperature.

Note 2: Format X.XXXX - "1" must be added for factors greater than .9999 (that is, for 60°F or 15°C.

NOTE 3: SWITCH 6 MUST BE RESET TO 0 OR 1 FOR NORMAL OPERATION

Switch 7 (S7) Gross/Net Display Selection / Register Reset

Switch Centered	Net (compensated) volume displayed - Note 4
Switch Left	Gross (uncompensated) volume displayed
Switch Right	Momentary - resets register

Note 4: If a compensator is not installed, the gross volume is displayed in either switch setting.

Section 4 – MID:COM E:Count Specifications

Electrical Requirements

Operating Voltage: 10–30 VDC unregulated
Operating Current: Standby 275 mA
Up to 2 solenoids activated: 1 A additional each

Operating Environment

Outdoors exposed to elements
Temperature Range: –40°C to +60°C (–40°F to 140°F)
Humidity: 100% Condensing

Enclosure

Aluminum permanent mold casting with epoxy powder coat
Rating: IP–66 and NEMA–4
Silicone gasket for keyboard and cover seals
Calibration and Program Screws seal with BUNA 'O' Ring

Environmental Testing

Temperature Range: –40°C to +60°C (–40°F to 140°F)
Vibration: 3 Gs, 30 Hz, 2 axes, 72 hours
Shock: 4 foot drop to concrete, 3 axes, 5 times each

Interconnect

Up to 4 multi–pin circular plastic connectors
Sealed to IP–68 standards
Compensator Probe uses a 1/4" NPT compression fitting with thread sealant

Metrological Sealing

Drilled head screws for:
- Calibration Switch
- Program Switch
- Enclosure Cover
- Connectors Seal Plate
- All Mounting Accessories

Mounting

Industry standard 'Veeder–Root' bolt circle with 1/4–20 threads
Adapters available to mount all currently available meters

Inputs/Outputs

Pulse Input

Internal: 100 pulse-per-revolution (ppr) dual channel quadrature encoder for rotational input from positive displacement meters

External: Single or dual channel input from meters with electrical output, 3 to 30 V signal

Pulse Output

Calibrated pulse output for remote counting or monitoring devices.

Raw encoder pulse output for connection to small volume piston provers.

Powered Control Outputs

Three (3) High-side 12 V drivers for use with solenoid valves and other devices.

Analog Input

One (1) 4 to 20 mA current loop for applications including tank gauging.

Communications

Four (4) RS-232 compliant serial ports for use with printers, external computing devices, etc.

Calibration

Prescale Factor (MRATIO) Range: 1 to 99

Calibration Factor Range: 0.0001 to 1.9999

Compensation Accuracy: Four (4) decimal places from lookup table

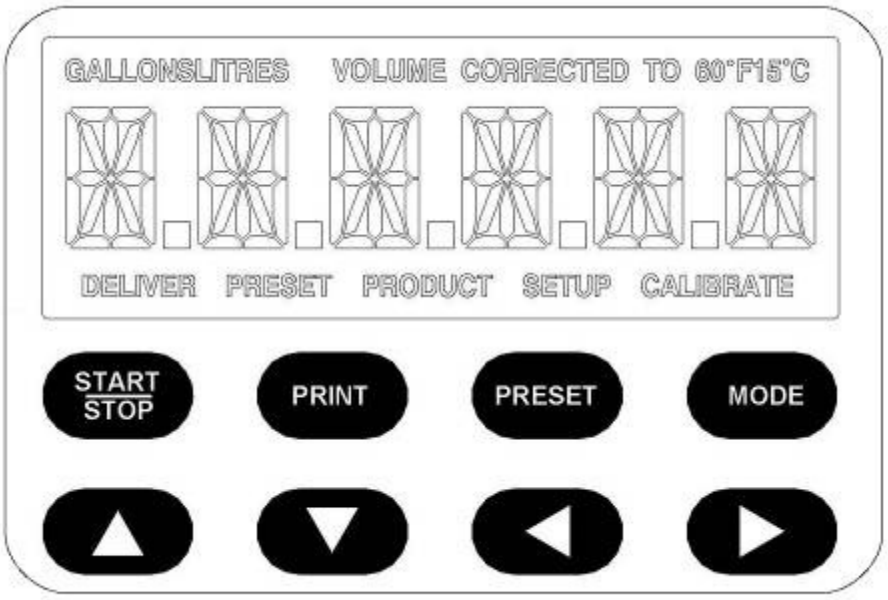
Registration Capacity (Units)

Delivery: -99999.9

Totalizer: 9999999.9

E:Count Register Display and Layout

Figure 16. E:Count LCD and Keyboard Layout



GALLONSLITRES	'GALLONS' or 'LITRES' indicates the current Volume Mode (US or Metric).
VOLUME CORRECTED TO 60F15C	Displayed whenever the Temperature Compensation is active. '60F' in Gallons Mode, 15C' in Liters mode.
DELIVER	Indicates Delivery Mode is active and will display until the Fuel Delivery Ticket prints.
PRESET	Indicates the Preset Volume is being changed.
PRODUCT	Indicates the Product Code is being changed.
SETUP	Displayed in the Delivery Menu and the Calibration Menu.
CALIBRATE	Indicates the Calibration Screw has been backed out – will display until the Calibration Screw is tightened.

Special Note on E:Count Keyboard Entry

The E:Count uses special technique called **PRESS & HOLD** for keyboard entry. This technique eases keyboard operation, especially when wearing gloves, in the absence of any audible or tactile feedback. Simply press a button and wait for the desired action.

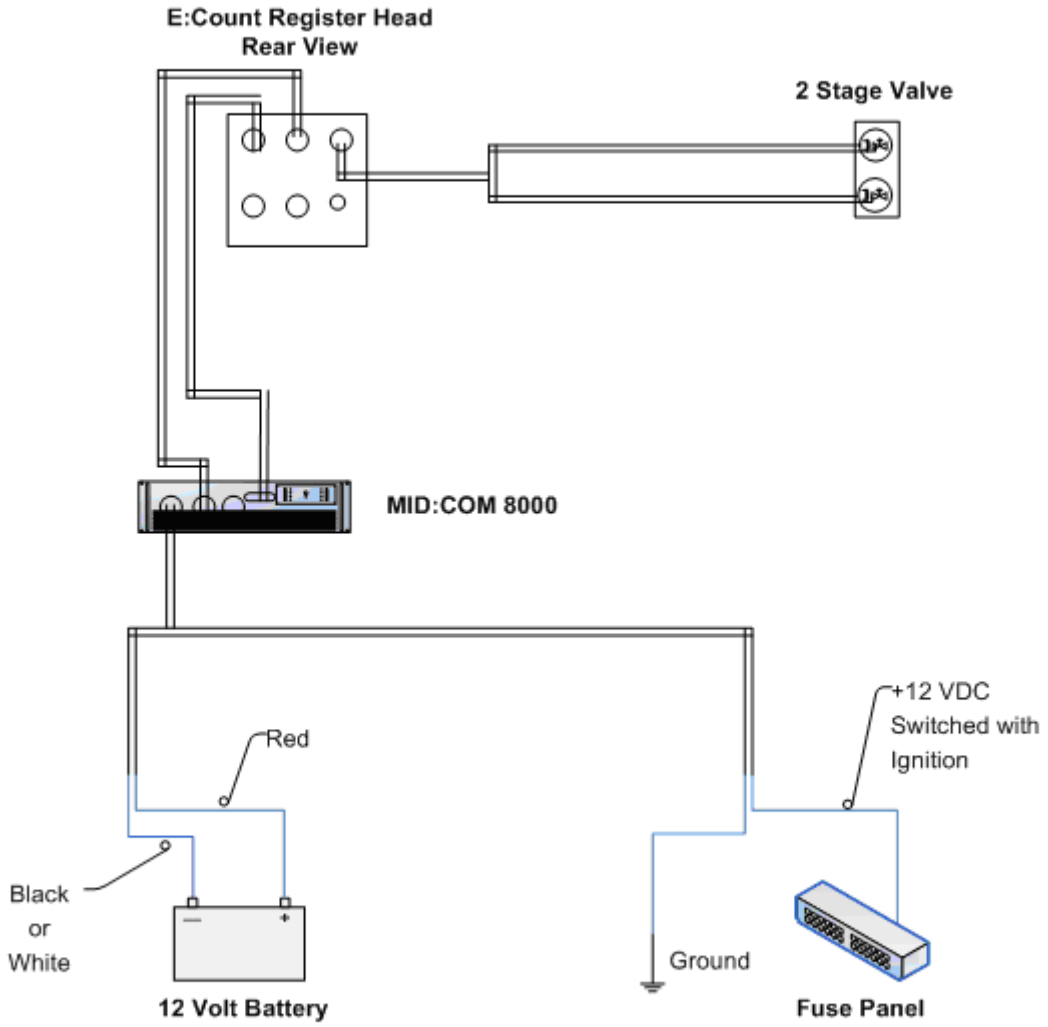
Examples:

- For menus press & hold the mode key until the selection appears.
  - PRESS & HOLD **<START/STOP>** to enter that selection.
  - PRESS & HOLD **<START/STOP>** to exit the selection.
- To enter number PRESS & HOLD the **<RIGHT>** or **<LEFT>** arrow keys to select the digit to be changed. To change the number PRESS & HOLD the **<UP>** or **<DOWN>** arrow.
- To start a delivery PRESS & HOLD **<START/STOP>.**
- To enter a preset PRESS & HOLD **<PRESET>.**

Pressing and releasing a button may give results but it is only coincidental that the button was held long enough.

E:Count Register Display and Layout

Figure 17. E:Count Wiring Diagram



Section 5 – MID:COM E:Count Calibration

E:Count Overview and Theory of Operation

Meter Calibration and Temperature Compensation

The MID:COM E:Count model MCR-05 is a general purpose electronic meter register for use with mechanical positive displacement meter with rotational output as well as other types of meters with electronic pulse outputs. In the case of a rotational output, the E:Count has an internal 100 pulse per revolution (ppr) quadrature encoder which converts the meter rotation to a pulse train. Meter calibration and optional temperature compensation techniques are all digital in nature and are explained below.

Meter Calibration (Un-compensated)

Meter calibration is a two step process. First a prescale factor called MRATIO must be determined and entered. This number is an integer value from 1 to 99 and only needs to be entered when the E:Count is initially installed.

This factor serves three purposes:

1. It allows the resulting calibration factor to remain just above or below unity which preserves the "1 part in 10,000" calibration resolution. For example, if there were 10 times too many pulses per unit volume the calibration factor would be near 0.1. This would result in the least significant digit of the calibration factor representing 1 part in 1000.
2. It allows for the elimination of mechanical adjusters and gear reductions which can add torque to the meter as well as wear out and slip.
3. It allows for a convenient way to change units of measure such as: gallons, liters, kilograms, etc.

This factor can be determined by trial and error or by contacting MID:COM with the following information:

1. Meter manufacturer.
2. Meter size.
3. Units of measure.

E:Count Overview (continued)

The second step in calibration, and only step after initial installation, is to determine the calibration factor with a prover or master meter. For initial installation a factor of 1.0000 should be used as a point of reference. Subsequently use the present factor.

With a factor near unity, the meter error as expressed by PROVER VOLUME/REGISTER VOLUME results in a percentage in which the error can be added or subtracted to the current calibration factor as needed.

Another way to view the factor is that the digits to the right of the decimal represent the following:

- First digit – tens of units/hundred units
- Second digit – units/hundred units
- Third digit – tenths of units/hundred units
- Fourth digit – hundredths of units/hundred units.

The calibration factor represents the value of each pulse as it is received by the E:Count. These are added to each other and the resultant sum is compared to the volume currently displayed. If the new rounded value is greater than the current displayed value the displayed value is adjusted accordingly.

E:Count Overview (continued)

Temperature Compensation

Temperature compensation is done by table lookup only. The E:Count is loaded with the appropriate API or ASTM table for the following products:

Comp Table #	Description
00	UNCOMPENSATED
01	PROPANE
02	DIESEL/HEATING OIL
03	GASOLINE
04	LUBE OIL
05	METHANOL
06	ANHYDROUS AMMONIA
07	JET-A FUEL
08	JET-B FUEL
09	ETHANOL

The tables are interpolated and extrapolated as necessary to have 1024 entries ranging from -40 to +62.4 degrees Celsius in 0.1 degree steps. As each pulse is received the temperature is sampled and the corresponding table entry for that temperature is multiplied by the calibration factor. The result is added, rounded and displayed as described above, but as a separate value.

Thus, there is always a running count of uncompensated AND compensated volumes. After the delivery these values can be toggled on the display to facilitate computations without the need to run BOTH compensated and uncompensated tests.

Both the current temperature and its associated table value can be displayed. If adjustment is necessary for the net volume, the temperature is adjusted up or down to obtain the table value necessary for the next test to be accurate.

It can occur that when an accurate test is obtained, the displayed temperature is not the same as the test thermometer temperature. There can always be small discrepancies since the temperature can vary during the delivery and the displayed temperature is what the product is at after the delivery.

E:Count Overview (continued)

However, if the difference is large the following needs to be considered:

1. The displayed temperature will always correspond to the correct table value.
2. The resulting calculations using that value will also always be correct.
3. The table in the E:Count may not be the same as the one being used for the test.
4. The product being tested is not exactly the same as what the table is intended for.

The fourth item is the most common source of error especially in the case of propane. In the summer months it is quite common for refiners to blend in other products with higher or lower coefficients of expansion thus skewing the test.

There is no inherent problem with adjusting the temperature to make the test come out correctly, however if the product changes later on, the system may go out of tolerance. This situation has come up so often that it is necessary to emphasize that the compensator may be working as designed and consideration should be given to other factors affecting the test.

Figure 18. Serial Preset Wiring Diagram

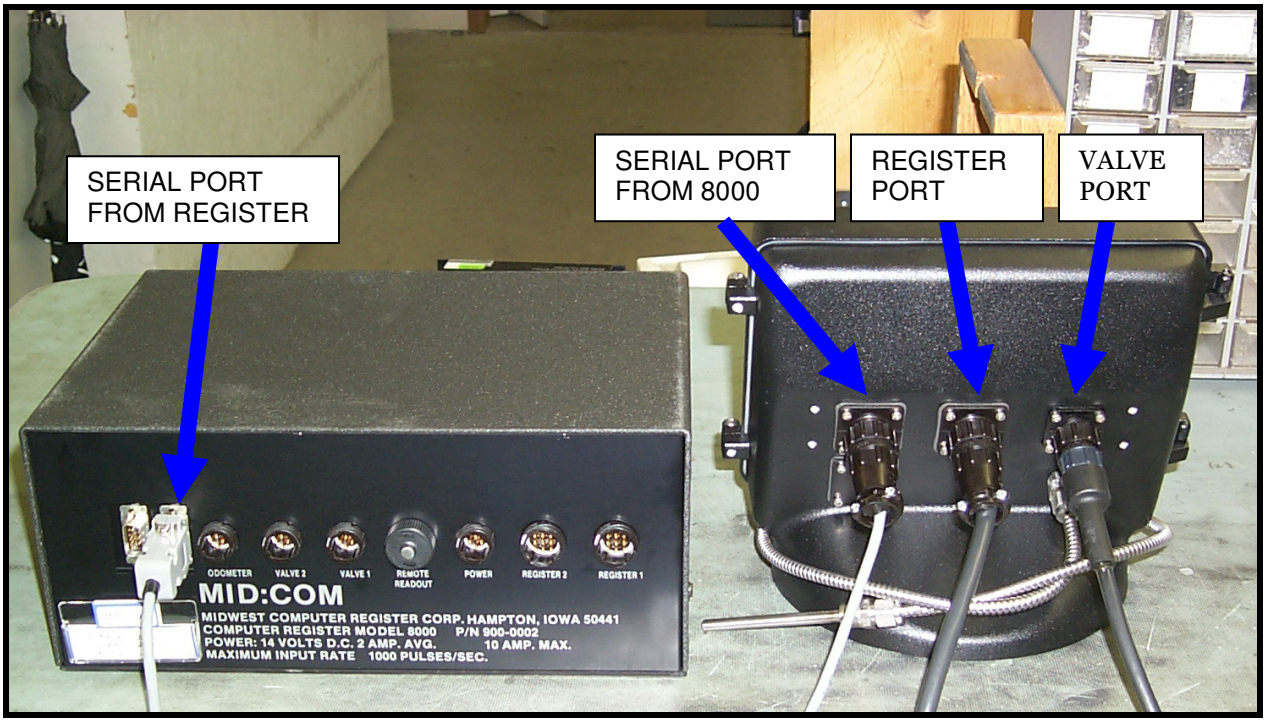
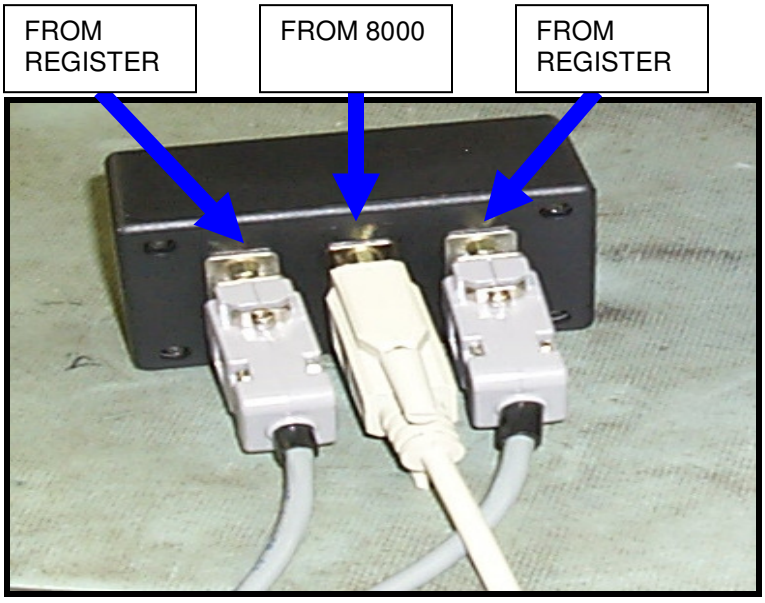


Figure 19. Serial Preset Connector Box Diagram



THE INSIDE SERIAL PORT OF THE COMPUTER CONNECTS TO THE OUTSIDE 9 PIN CIRCULAR CONNECTOR OF THE REGISTER
IN A DUAL APPLICATION, THE INSIDE SERIAL PORT OF THE COMPUTER CONNECTS TO THE MIDDLE CONNECTOR OF THE DUAL ADAPTER BOX. THE OUTSIDE 2 CONNECTORS OF THE DUAL ADAPTER BOX CONNECTS TO THE OUTSIDE 9 PIN CIRCULAR CONNECTORS OF THE REGISTERS.

E:Count 8000 Serial Preset – Continued

SOFTWARE VERSIONS

8000 computer needs to have software version P8??X? for Gallons
8000 computer needs to have software version P15??X? for Litres
Ecount register head needs to have software version E832G or higher and the EM8 or higher chip installed

DIFFERENCES WITH SERIAL COMMUNICATION

There must be a serial cable connecting the inside serial port of the 8000 to the outside 9 pin connector of the E:Count.

There is a MID:COM MATRIX program that allows you to enter a 25 character description for each product code 01–99 but only the first 24 characters will print on the ticket. The MATRIX will also allow you to enter calibration factors, dwell settings, and compensation tables for each product code 01–99.

E:Count 8000 Serial Preset – Continued

CHANGES IN THE 8000

On the load truck screen each product code from 01-99 stores it's own quantity. Any product code with a quantity other than zero will print the quantity on board on the shift ticket.

If you are using a datacard, after you select the customer, it gets the product code from the card and shows it on the display. With no datacard it will bring up the last entered product code. Once you down arrow from the product code screen, the 8000 checks the E:Count to see if the product code entered is a product code that has been calibrated in the E:Count during setup. If it is; the 8000 proceeds to the price, tax, and preset screen. If it is not a valid product code, the 8000 displays "INVALID PRODUCT CODE" and goes back to the product code screen. The only way to get out of the product code screen is to enter a product code that is calibrated in the E:Count.

The 8000 is ALWAYS preset on dollars therefore the volume is preset in tenths.

When you enter a preset in the 8000 it automatically transfers that preset amount to the E:Count when you insert a ticket.

You can still change both the product code and preset amount at the E:Count head. The inventory will still be deducted from the product code that was entered in the 8000. The preset on the 8000 will count down from what was entered; however, this number does not matter as the E:Count is controlling the valves.

Once the delivery is done and the ticket is printed, the last 2 lines of the ticket are product description and the volume corrected message. The product description is determined by the product code that was entered for the delivery. The volume corrected message only prints if the product code is calibrated with the compensator enabled.

The shift ticket prints on 2 tickets.

Once you insert a ticket in the 8000, you must press the start/stop button on the E:Count to initiate the delivery.

Once you reach the preset, you have the option of reopening the valves to continue with that delivery or represent by entering another preset amount that would get added to the previous preset amount.

E:Count Calibration Mode

To enter Calibration Mode back out the <**CALIBRATION SCREW>** – the E:Count will display ***CALBRT MODE*** and enter Calibration Mode.

If the **Compensator** is turned **ON,** the VOLUME CORRECTED TO legend will display and the **Net Volume** will be displayed. If the **Compensator** is turned **OFF,** the VOLUME CORRECTED TO legend will **NOT** display and the **Gross Volume** will be displayed.

Security Valve Note: The security valve will be open while the E:Count is in Calibration Mode allowing the operator to directly control product flow.

Delivery Ticket Note: No delivery tickets will be needed while the E:Count is in Calibration Mode.

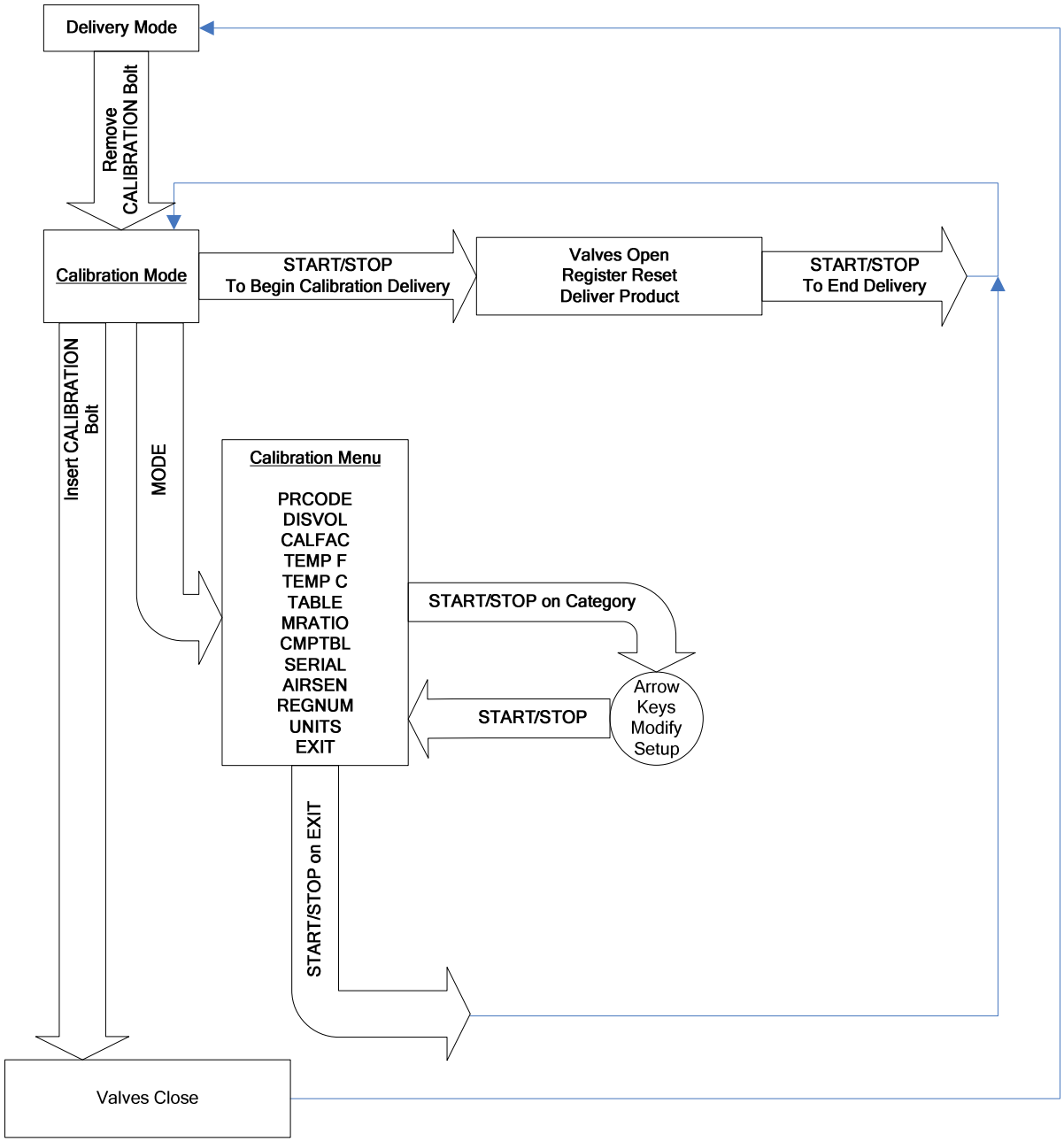
At the completion of Calibration Mode (after the tightening of the **<CALIBRATION SCREW>**) the E:Count will return to Delivery Mode.

Note on Calibration Data:

Set the **Product Code** before changing any calibration data. The **Calibration Factor**, **Compensation Setting** (enabled or disabled), and the **Stage 2 Dwell** are all stored separately for each **Product Code.** Changing the **Product Code** will load the saved value for each of these variables.

E:Count Calibration Mode (continued)

Figure 20. E:Count Calibration Process



E:Count Calibration Mode (continued)

Calibration Menu Categories:

- ***PRCODE*** – Display or Change the Current Product Code
- ***DISVOL*** – Display Gross and Net Volumes
- ***CALFAC*** – Display or Change the Calibration Factor
- ***TEMP F*** – Display or Change the Product Temp in Degrees F
- ***TEMP C*** – Display or Change the Product Temp in Degrees C
- ***TABLE*** – Display the current Compensation Table Value
- ***MRATIO*** – Display or Change the Meter Ratio
- ***CMPTBL*** – Display or Change the Compensation Table Number
- ***SERIAL*** – Display or Change the Register Serial Number
- ***AIRSEN*** – Display or Change the Air Sensor setting
- ***REGNUM*** – Display or Change the Active Register Number
- ***UNITS*** – Display or Change Units as either Gallons or Litres
- ***EXIT*** – Return to Calibration Mode

When entering the Calibration Menu the E:Count will display the current Calibration Menu Category.

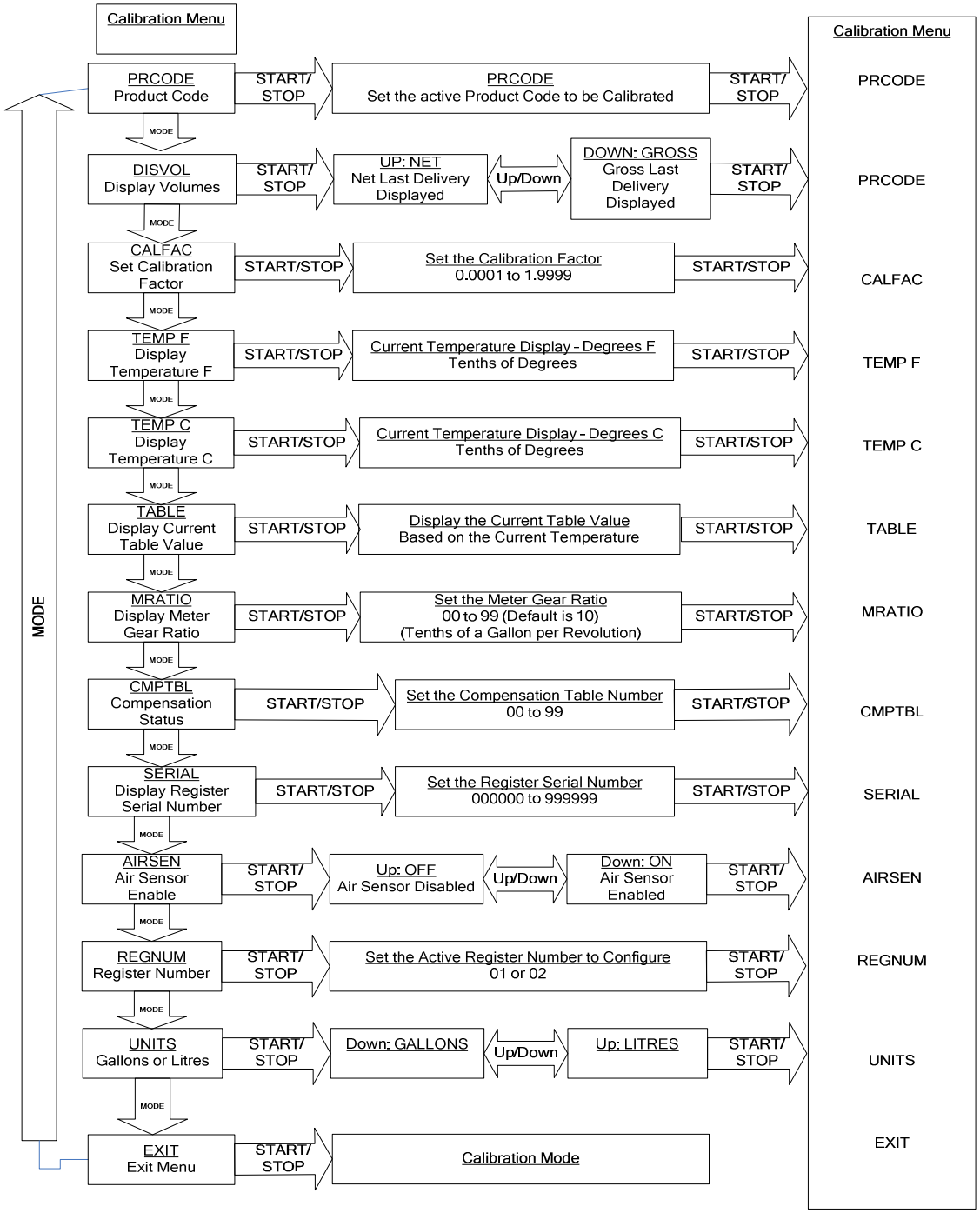
To display the next Calibration Menu Category press **<MODE>.**

To view or modify the visible Calibration Menu Category press **<START/STOP>.**

To exit the Calibration Menu and return to Calibration Mode press and hold **<MODE>** or press and hold **<RIGHT ARROW>** until the E:Count displays ***EXIT*** and then press **<START/STOP>.**

E:Count Calibration Menu

Figure 21. E:Count Calibration Menu



E:Count Calibration Menu (continued)

E:Count Calibration Menu Categories

PRCODE – Product Code

- Press **<START/STOP>** to set the current **Product Code.**
- The **Product Code** is a 2-digit number from 00 to 99.
- Use the **<ARROW>** keys to change the **Product Code.**
- Press **<START/STOP>** to save the **Product Code** and return to the Calibration Menu.

Note:
Changing the **Product Code** affects all calibration data. The **Calibration Factor**, **Temperature Compensation Setting** (enabled or disabled), and the **Stage 2 Dwell** are all stored separately for each **Product Code.** Changing the **Product Code** will load the saved value for each of these variables.

DISVOL – Display Volumes

- Press **<START/STOP>** to display the **Gross Volume** or the **Net Volume** of the previous delivery.
- Press **<UP>** to display the **Net Volume.**
- Press **<DOWN>** to display the **Gross Volume.**
- Press **<START/STOP>** to return to the Calibration Menu.

CALFAC – Calibration Factor

- Press **<START/STOP>** to set the **Calibration Factor.**
- The **Calibration Factor** is a number from 0.0000 to 1.9999.
- Use the **<ARROW>** keys to change the **Calibration Factor.**
- Press **<START/STOP>** to save the **Calibration Factor** and return to the Calibration Menu.

Note:

$$\text{New Factor} = \frac{\text{Prover Volume}}{\text{Gross Register Volume}} * \text{Old Factor}$$

TEMP F – Temperature in Degrees Fahrenheit

- Press **<START/STOP>** to display the **Current Temperature.**
- The current **Temperature in Degrees Fahrenheit** will be displayed (if the temperature probe is installed).
- Use the **<UP>** and **<DOWN>** Arrow keys to change the Temperature set point for the probe.
- Press **<START/STOP>** to return to the Calibration Menu.

E:Count Calibration Menu (continued)

***TEMP C* – Temperature in Degrees Celsius**

- Press **<START/STOP>** to display the **Current Temperature.**
- The current **Temperature in Degrees Celsius** will be displayed (if the temperature probe is installed).
- Use the **<UP>** and **<DOWN>** Arrow keys to change the Temperature set point for the probe.
- Press **<START/STOP>** to return to the Calibration Menu.

***TABLE* – Table Value at Current Temperature**

- Press **<START/STOP>** to display the current value in the compensation table based on the current temperature.
- Press **<START/STOP>** to return to the Calibration Menu.

***MRATIO* – Meter Ratio**

- Press **<START/STOP>** to enter the **Meter Ratio.**
- Use the ***<ARROW>*** buttons to set the **Meter Ratio.**
- Press **<START/STOP>** to save the **Meter Ratio** and return to the Calibration Menu.

Note: Contact the MID:COM factory or your distributor for more information about meter ratios and suggested values.

Figure 22. E:Count Recommended Meter Ratios

LC METER TYPE	TCS METER TYPE	REV/GAL	REV/LITRE	1:1 GAL	2:1 GAL	1:1 LITRE	2:1 LITRE
M5	700-15	4.08	1.05	40	20	10	5
M7	700-20	5.55	1.42	55	27	14	7
M15	700-30	2.06	0.53	21	10	5	2
M25	700-35	2.06	0.53	21	10	5	2
M30	700-40	0.74	0.19	7	3	2	1
M60	700-45	0.40	0.103	4	2	1	1
2" NEPTUNE				10		2	
2" SMITH				10		2	

E:Count Calibration Menu (continued)

CMPTBL – Temperature Compensation Table

- Press **<START/STOP>** to display **Temp. Comp. Table.**
- Use the ***<ARROW>*** buttons to set the **Temp. Comp. Table.**
- Press **<START/STOP>** to save the **Temp. Comp. Table** and return to the Calibration Menu.

Comp Table #	Description
00	UNCOMPENSATED
01	PROPANE
02	DIESEL/HEATING OIL
03	GASOLINE
04	LUBE OIL
05	METHANOL
06	ANHYDROUS AMMONIA
07	JET-A FUEL
08	JET-B FUEL
09	ETHANOL

NOTE: To disable Temperature Compensation enter 00.

SERIAL – E:Count Serial Number

- Press **<START/STOP>** to set the **E:Count Serial Number.**
- The current **E:Count Serial Number** will be displayed.
- This is intended to allow a circuit board in the E:Count to be replaced and set the **E:Count Serial Number** to match the Faceplate of the E:Count.
- Use the ***<ARROW>*** buttons to set the **E:Count Serial Number.**
- Press **<START/STOP>** to save the **E:Count Serial Number** and return to the Calibration Menu.

E:Count Calibration Menu (continued)

***AIRSEN* – Optical Air Sensor**

- Press **<START/STOP>** to display the **Air Sensor** setting.
- Press the **<DOWN ARROW>** to **ON** to **enable the Air Sensor.**
- Press the **<UP ARROW>** to **OFF** to **disable the Air Sensor.**
- Press **<START/STOP>** to save the **Air Sensor** setting and return to the Calibration Menu.

NOTE: The ***AIRSEN*** requires an Electronic Air Sensor (or Electronic Air Eliminator) hardware to be installed. Contact your distributor for more information.

NOTE: The ***AIRSEN*** Menu Item in the *Calibration Menu* is an ON/OFF toggle.

NOTE: If an LC Electronic Air Eliminator is connected to the E:Count the ***AIRSEN*** feature needs to be turned on for the hardware features to be activated.

NOTE: If the ***AIRSEN*** feature is ***ON*** and a Sensor is not connected the valves will never open.

***REGNUM* – Register Port Number**

- Press **<START/STOP>** to display the **current Register Number.**
- Use the ***<ARROW>*** buttons to set the **current Register Number.**
- Press **<START/STOP>** to save the **Register Number** and return to the Calibration Menu.

NOTE: When using the E:Count in standalone mode enter '01' for the Register Number. When using the E:Count in a dual-head configuration with two registers enter '01' or '02' depending on which head is being configured. Both heads must be configured separately.

***UNITS* – Register Units**

- Press **<START/STOP>** to display the **Units.**
- Press the **<UP ARROW>** to select **LITRES.**
- Press the **<DOWN ARROW>** to select **GALLONS.**
- Press **<START/STOP>** to save the **Units** and return to the Calibration Menu.

***EXIT* – Exit Calibration Menu**

- Press <START/STOP> to exit the Calibration Menu and return to Calibration Mode.

E:Count Register Valve Control Options

When the MID:COM E:Count Electronic Register is connected to a MID:COM 8000 Electronic Computer, the E:Count is in control of the security valves.

The Calibration must be performed on the MID:COM E:Count.

E:Count Delivery – E:Count controls the valves

1. The driver manually enters the Preset Quantity on the E:Count.
2. The E:Count will automatically shut the valves when the Preset Quantity has been reached.
3. If necessary the driver has the ability to restart the delivery after the Preset has been reached and continue the current delivery.
4. If necessary the driver has the ability to enter a new Preset Quantity and continue the delivery to the new Preset Quantity. In addition the driver may repeat this process as many times as necessary.
5. Operation – the Operator may:
    a. Set the Preset Amount on the E:Count using the **<PRESET>** button.
    b. Begin and End the delivery process on the E:Count using the **<START/STOP>** and **<PRINT>** buttons respectively
    c. End the delivery and print the delivery ticket by pressing **any button** on the 8000.
    d. Compute and add a discount by pressing **<DISC>** on the 8000.

Figure 23. E:Count Menu Reference when Used with 8000

PRESS MODE BUTTON
TO DISPLAY FLOW RATE DURING DELIVERY

Deliver Mode - Delivery Active

MODE
FRXXXX

Rate = xxxx units/minute

Deliver Mode - Ticket Ready

PRCODE	DISVOL	SETUP	EXIT
▲▼◄►	▲▼	ENT CODE	dlv mode
NOGOOD		NOGOOD	
		OK	

Setup Mode

NEWCOD	STAGE1	STAGE2	EXIT
▲▼◄►	▲▼◄►	▲▼◄►	dlv mode

Calibration Mode

PRCODE	DISVOL	CALFAC	TEMP F	TEMP C	TABLE	MRATIO	CMPTBL	SERIAL	AIRSEN	REGNUM	UNITS	EXIT
▲▼◄►	▲▼	▲▼◄►	▲▼	▲▼	displays	▲▼◄►	▲▼◄►	▲▼◄►	▲▼	▲▼◄►	▲▼	cal mode

MID:COM E:Count Commands
Used with MID:COM 8000
Version: E833G
April 10, 2008

Press & Hold keys until the desired item is shown or until the desired action is taken.

Press & Hold <MODE> to cycle through Menu Items.

Press & Hold <START/STOP> to select the Menu Item for display and update.

Press & Hold <START/STOP> again to return to the Menu Item selection.

E:Count Calibration Instructions

A. E:Count Valve Control with Non-Compensated Register

1. BACK OUT CALIBRATION SCREW – WILL DISPLAY CALIBRATE
2. PRESS MODE UNTIL PRCODE IS DISPLAYED, PRESS S/S
3. CHANGE THE PRODUCT CODE TO WHAT YOU WANT TO CALIBRATE, PRESS S/S
4. PRESS MODE UNTIL YOU SEE CALFAC, PRESS S/S
5. VERIFY THERE IS A CAL FACTOR, ENTER A FACTOR OF 1.0000 IF THERE ISN'T A FACTOR ALREADY, PRESS S/S
6. PRESS MODE OR RIGHT ARROW UNTIL EXIT IS DISPLAYED AND PRESS S/S
7. PRESS S/S ON REGISTER – WILL RESET REGISTER AND DISPLAY DELIVER
8. FILL PROVER
9. PRESS S/S ON REGISTER – DELIVER WILL DISAPEAR FROM DISPLAY
10. WRITE DOWN THE AMOUNT ON REGISTER
11. PRESS THE MODE BUTTON UNTIL YOU SEE CALFAC
12. PRESS S/S TO DISPLAY CURRENT CALIBRATION FACTOR
13. TAKE THE PROVER READING / REGISTER READING * CAL FACTOR = NEW CAL FACTOR
14. ENTER THE NEW CALIBRATION FACTOR
15. PRESS S/S TO GET BACK TO CALFAC
16. PRESS MODE OR RIGHT ARROW UNTIL EXIT IS DISPLAYED
17. PRESS S/S TO TAKE YOU BACK TO THE DELIVERY SCREEN
18. START OVER AT #7 UNTIL THE REGISTER MATCHES THE PROVER
19. IF CALIBRATING MORE THAN ONE PRODUCT, START AT #2 FOR EACH PRODUCT
20. ONCE THE PROVER & REGISTER MATCH FOR ALL PRODUCTS SCREW IN THE CAL SCREW AND RESTART THE SYSTEM

E:Count Calibration Instructions (continued)

B. E:Count Valve Control with Compensated Register

1. BACK OUT CALIBRATION SCREW – WILL DISPLAY CALIBRATE
2. PRESS & HOLD MODE UNTIL TEMP F IS DISPLAYED
3. PRESS S/S TO DISPLAY TEMPERATURE
4. ▲ OR ▼ TO DISPLAY THE CORRECT TEMPERATURE
5. PRESS S/S TO GET BACK TO TEMP F
6. PRESS MODE OR RIGHT ARROW UNTIL EXIT IS DISPLAYED
7. PRESS S/S TO GET BACK TO DELIVERY SCREEN
8. PRESS MODE UNTIL PRCODE IS DISPLAYED, PRESS S/S
9. CHANGE THE PRODUCT CODE TO WHAT YOU WANT TO CALIBRATE, PRESS S/S
10. PRESS MODE UNTIL YOU SEE CALFAC, PRESS S/S
11. VERIFY THERE IS A CAL FACTOR, ENTER A FACTOR OF 1.0000 IF THERE ISN'T A FACTOR ALREADY, PRESS S/S
12. PRESS MODE UNTIL CMPTBL IS DISPLAYED AND PRESS S/S
13. ENTER THE CORRECT COMPENSATION TABLE FOR CURRENT PRODUCT CODE
14. PRESS S/S TO GO BACK TO CMPTBL
15. PRESS MODE OR RIGHT ARROW UNTIL EXIT IS DISPLAYED AND PRESS S/S
16. PRESS S/S ON REGISTER – WILL RESET REGISTER AND DISPLAY DELIVER
17. FILL PROVER
18. PRESS S/S ON REGISTER – DELIVER WILL DISAPEAR FROM DISPLAY
19. PRESS THE MODE BUTTON UNTIL YOU SEE DISVOL
20. PRESS S/S TO DISPLAY VOLUME
21. YOU CAN DISPLAY THE NET & GROSS VOLUME USING ▲ & ▼ ARROWS
22. WRITE DOWN THE GROSS VOLUME
23. PRESS S/S TO GET BACK TO PRCODE
24. PRESS THE MODE BUTTON UNTIL YOU SEE CALFAC
25. PRESS S/S TO DISPLAY CURRENT CALIBRATION FACTOR
26. TAKE THE PROVER READING / GROSS REGISTER READING * CAL FACTOR = NEW CAL FACTOR
27. ENTER THE NEW CALIBRATION FACTOR
28. PRESS S/S TO GET BACK TO CALFAC
29. PRESS MODE OR RIGHT ARROW UNTIL EXIT IS DISPLAYED
30. PRESS S/S TO TAKE YOU BACK TO THE DELIVERY SCREEN
31. START OVER AT #16 UNTIL THE GROSS GALLONS MATCH THE PROVER
32. ONCE THEY MATCH, THE NET GALLONS SHOULD EQUAL THE GROSS GALLONS TIMES THE VOLUME CORRECTION FACTOR FOR THE CURRENT TEMPERATURE
33. IF CALIBRATING MORE THAN ONE PRODUCT, START AT #8 FOR EACH PRODUCT
34. ONCE THE PROVER & REGISTER MATCH AND ALL CALCULATIONS ARE CORRECT FOR ALL PRODUCTS, SCREW IN THE CAL SCREW AND RESTART THE SYSTEM

Electronic Versus Mechanical Temperature Compensation

Although difficult to quantify, our experience in the meter calibration business has shown that as much as a 1 percent gain in delivery product can be gained by the use of electronic compensation. In some cases more. There are a number of reasons:

1. Mechanical compensators use expanding bellows, which can only approximate the actual characteristics of the product. In the case of propane, it is a very poor match. The MID:COM electronic compensator uses the API Tables to calculate the exact correction for every tenth of a degree from –40 to +160. Mechanical compensators will only operate to –10 degrees. When you need it most, it can't do the job.

2. With the exception of a collapsed bellows, all of the many problems a mechanical compensator can have results in a loss to the dealer. Slipping clutches and ratchet assemblies can cause enormous losses that can go unnoticed until inventories are checked. The electronic compensator does not wear out and should not require adjustment. Mechanical compensators may require adjustment with major changes in temperature.

3. Mechanical compensator may take several minutes to react to a change in temperature. The electronic compensator calculates a new correction factor every tenth of a gallon, with accuracy to four decimal places.

4. Mechanical compensators put a considerable drag on the metering element, gear trains and mechanical adjusters, causing product slippage through the meter and premature failure of all the mechanical components. The electronic compensator has no moving parts, and coupled with electronic calibration puts no additional drag on the meter. Maintenance costs alone will pay for the compensator.

Figure 24. Volume Correction Factors for Propane

VOLUME CORRECTION FACTORS
SPECIFIC GRAVITY 0.505 TO .0514 - L.P.G.

Observed Temperature 'F		Observed Temperature 'F		Observed Temperature 'F	
-20	1.114	24	1.055	68	0.987
-19	1.113	25	1.054	69	0.985
-18	1.111	26	1.052	70	0.984
-17	1.11	27	1.051	71	0.982
-16	1.108	28	1.049	72	0.981
-15	1.107	29	1.048	73	0.979
-14	1.106	30	1.046	74	0.977
-13	1.104	31	1.045	75	0.976
-12	1.103	32	1.043	76	0.974
-11	1.101	33	1.042	77	0.972
-10	1.1	34	1.04	78	0.97
-9	1.099	35	1.039	79	0.969
-8	1.098	36	1.037	80	0.967
-7	1.096	37	1.036	81	0.965
-6	1.095	38	1.034	82	0.963
-5	1.094	39	1.033	83	0.962
-4	1.093	40	1.031	84	0.96
-3	1.092	41	1.03	85	0.958
-2	1.09	42	1.028	86	0.956
-1	1.089	43	1.027	87	0.955
0	1.088	44	1.025	88	0.953
1	1.086	45	1.024	89	0.951
2	1.085	46	1.022	90	0.949
3	1.084	47	1.021	91	0.947
4	1.082	48	1.019	92	0.946
5	1.081	49	1.018	93	0.944
6	1.08	50	1.016	94	0.942
7	1.078	51	1.014	95	0.94
8	1.077	52	1.012	96	0.939
9	1.076	53	1.011	97	0.937
10	1.074	54	1.009	98	0.935
11	1.073	55	1.008	99	0.933
12	1.071	56	1.006	100	0.932
13	1.07	57	1.005		
14	1.069	58	1.003		
15	1.068	59	1.002		
16	1.066	60	1		
17	1.065	61	0.998		
18	1.064	62	0.997		
19	1.062	63	0.995		
20	1.061	64	0.994		
21	1.06	65	0.992		
22	1.058	66	0.99		
23	1.057	67	0.989		

Figure 25. Volume Correction Factors for #2 Fuel Oil

VOLUME CORRECTION FACTORS
#2 FO - API GRAVITY 35 - COEFFICIENT OF EXPANSION .00045

Observed Temperature 'F		Observed Temperature 'F		Observed Temperature 'F	
-30	1.0414	14	1.0212	58	1.0009
-29	1.0409	15	1.0207	59	1.0005
-28	1.0405	16	1.0202	60	1
-27	1.05	17	1.0198	61	0.9995
-26	1.0396	18	1.0193	62	0.9991
-25	1.0391	19	1.0189	63	0.9986
-24	1.0386	20	1.0184	64	0.9982
-23	1.0382	21	1.0179	65	0.9977
-22	1.0377	22	1.0175	66	0.9972
-21	1.0373	23	1.017	67	0.9968
-20	1.0368	24	1.0166	68	0.9963
-19	1.0363	25	1.0161	69	0.9959
-18	1.0359	26	1.0156	70	0.9954
-17	1.0354	27	1.0152	71	0.9949
-16	1.035	28	1.0147	72	0.9945
-15	1.0345	29	1.0143	73	0.994
-14	1.034	30	1.0138	74	0.9936
-13	1.0336	31	1.0133	75	0.9931
-12	1.0331	32	1.0129	76	0.9926
-11	1.0327	33	1.0124	77	0.9922
-10	1.0322	34	1.012	78	0.9917
-9	1.0317	35	1.0115	79	0.9913
-8	1.0313	36	1.011	80	0.9908
-7	1.0308	37	1.0106	81	0.9903
-6	1.0304	38	1.0101	82	0.9899
-5	1.0299	39	1.0097	83	0.9894
-4	1.0294	40	1.0092	84	0.989
-3	1.029	41	1.0087	85	0.9885
-2	1.0285	42	1.0083	86	0.988
-1	1.0281	43	1.0078	87	0.9876
0	1.0276	44	1.0074	88	0.9871
1	1.0271	45	1.0069	89	0.9867
2	1.0267	46	1.0064	90	0.9862
3	1.0262	47	1.006	91	0.9857
4	1.0258	48	1.0055	92	0.9853
5	1.0253	49	1.0051	93	0.9848
6	1.0248	50	1.0046	94	0.9844
7	1.0244	51	1.0041	95	0.9839
8	1.0239	52	1.0037	96	0.9834
9	1.0235	53	1.0032	97	0.983
10	1.023	54	1.0028	98	0.9821
11	1.0225	55	1.0023	100	0.9816
12	1.0221	56	1.0018		
13	1.0216	57	1.0014		

Figure 26. 8000 Quick Calibration Sheet

Company
Address

MID:COM Quick Calibration Sheet

Product(s) Calibrated

Truck #

Date

Tester

☐ Approved

☐ Adjusted

Step	Example	1st Run	2nd Run	3rd Run
1. Initial Calibration Factor (if new, factory = 1.000 or 1.0000) or S/R from Neptune Register. ATC off – S7 left - if ATC used.	US Gallons, Model 8000 Initial Calibration Factor = 1.027			Note: If system will not calibrate by 3rd run, check the meter for wear or malfunction.
2. Gross Volume of Prover or (Master *Note. If no ATC, Gross = Net	100 gallons			
3. MID:COM Volume	97.3 gallons			
4 Prover - Register/100 =% error	100-97.3/100 = 0.027			
5. Add or Subtract % error to Calibration Factor to increase or decrease MID:COM volume. This is your new Calibration Factor.	1.027 0.028 1.054 New Calibration Factor			
6. For Temperature Corrected Products. Record MID:COM Net Volume after moving S7 to center.				
7. Calculated Net Volume in Prover.				

Note: US Gallons, x.xxx - S1 - S4. Liters 8000 and all SmartLinks, x.xxxx - S6 = first digit, then S1 - S4 for .xxxx

Section 6 – MID:COM E:Count Setup Mode

Setup Categories

NEWCOD – Display or Change the Security Code
STAGE1 – Display or Change the Stage 1 Shutoff Value
STAGE2 – Display or Change the Stage 2 Dwell Value
EXIT – Return to Delivery Mode

When entering Setup Mode the E:Count will require the operator to enter the **Security Code** to continue. After a valid Security Code is entered the E:Count will display the first Setup Category.

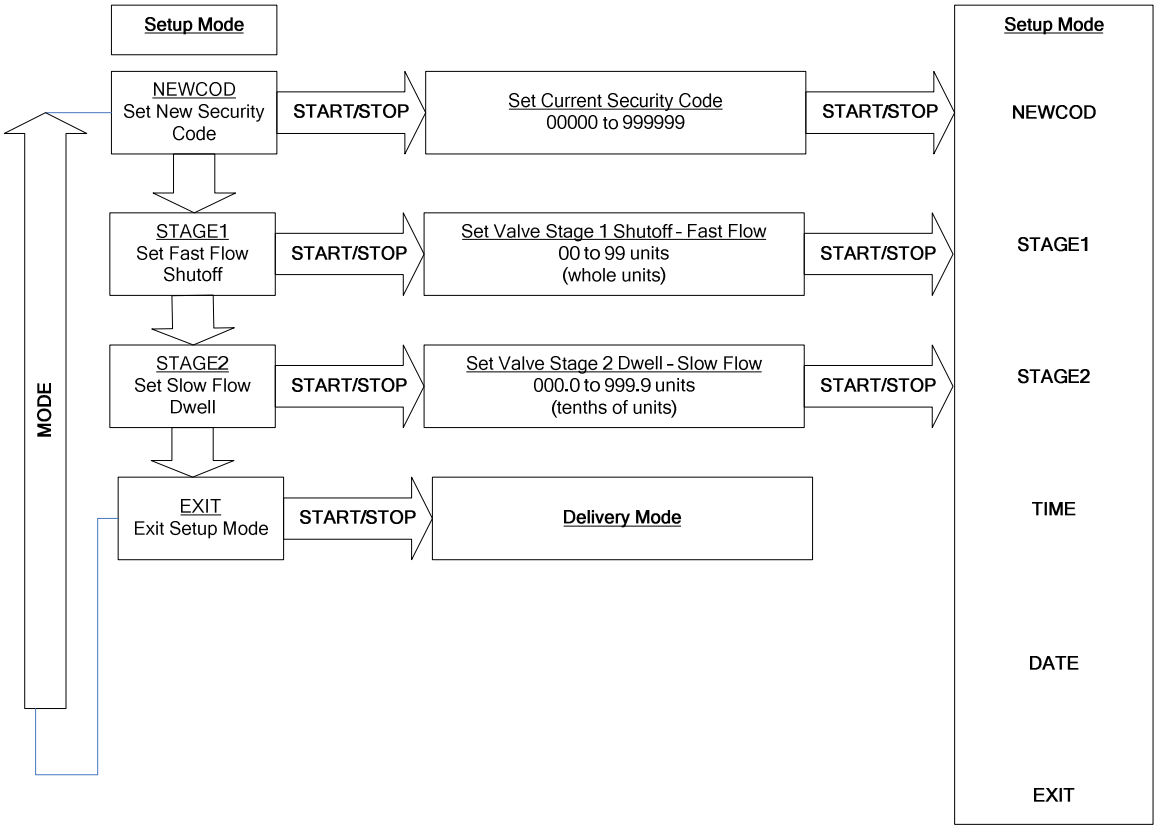
To display the next Setup Category press **<MODE>.**

To view or modify the Setup Category press **<START/STOP>.**

To exit Setup Mode and return to Delivery Mode press and hold **<MODE>** until the E:Count displays ***EXIT*** and then press **<START/STOP>.**

E:Count **Setup Mode (continued)**

Figure 27. E:Count Setup Mode



E:Count Setup Mode Category Details

NEWCOD – Set Security Code

- Press **<START/STOP>** to set the **Security Code.**
- The **Security Code** is 6 digits from 000000 to 999999.
- Use the **<ARROW>** keys to change the **Security Code.**
- Press **<START/STOP>** to save the **Security Code** and return to Setup Mode.

STAGE1 – Stage 1 (Fast Flow) Shutoff Volume

- Press **<START/STOP>** to set the **Stage 1 Shutoff** Volume.
- The **Stage 1 Shutoff** Volume is a whole number from 00 to 99.
- Use the **<ARROW>** keys to change the **Stage 1 Shutoff.**
- Press **<START/STOP>** to save the **Stage 1 Shutoff** and return to Setup Mode.

STAGE2 – Stage 2 (Slow Flow) Dwell Volume

- Press **<START/STOP>** to set the **Stage 2 Dwell** Volume.
- The **Stage 2 Dwell** Volume is tenths of units from 000.0 to 999.9.
- Use the **<ARROW>** keys to change the **Stage 2 Dwell.**
- Press **<START/STOP>** to save the **Stage 2 Dwell** and return to Setup Mode.

EXIT – Exit Setup Mode

- Press **<START/STOP>** to exit Setup Mode and return to Delivery Mode.

Section 7 – MID:COM E:Count Delivery Mode

E:Count Delivery Menu

E:Count Controls the Valves

Ticket Ready

Delivery Menu Categories

- ***PRCODE*** – Display or Change the Active Product Code
- ***DISVOL*** – Display the Gross and Net Delivery Volumes
- ***SETUP*** – Enter the Setup Menu
- ***EXIT*** – Return to Delivery Mode

To display the next Delivery Menu Category press **<MODE>.**
To view or modify the Delivery Menu Category press **<START/STOP>.**
To exit the Delivery Menu and return to Delivery Mode press and hold **<MODE>,** or press and hold **<RIGHT ARROW>** to display ***EXIT***, and then press **<START/STOP>.**

To enter Setup Mode press and hold **<MODE>** until ***SETUP*** is displayed in the Delivery Menu, then

1. Press **<START/STOP>**
   a. The E:Count will display ***ENTER CODE.***
2. Enter the **Security Code** and press **<START/STOP>.**
   a. If the **Security Code** is correct ***OK*** will be displayed and the E:Count will enter Setup Mode.
   b. If the **Security Code** entered is NOT correct ***NOGOOD*** will be displayed and the E:Count will return to Delivery Mode.

Note: The factory default **Security Code** is 000000.

E:Count Delivery Menu (continued)

Delivery Menu Categories

PRCODE – Product Code
Press **<START/STOP>** to set the current **Product Code.**
The **Product Code** is a 2-digit number from 00 to 99.
Use the **<ARROW>** keys to change the **Product Code.**
Press **<START/STOP>** to save the **Product Code** and return to Delivery Mode.

Note on Product Code:
Changing the **Product Code** affects all calibration data. The **Calibration Factor, Temperature Compensation Setting** (enabled or disabled), and the **Stage 2 Dwell** are all stored separately for each **Product Code.** Changing the **Product Code** will load the saved value for each of these variables.

DISVOL – Volumes
Press **<START/STOP>** to display the **Gross Volume** or the **Net Volume** of the previous delivery.
Press **<UP>** to display the **Net Volume.**
Press **<DOWN>** to display the **Gross Volume.**
Press **<START/STOP>** to return to Delivery Mode.

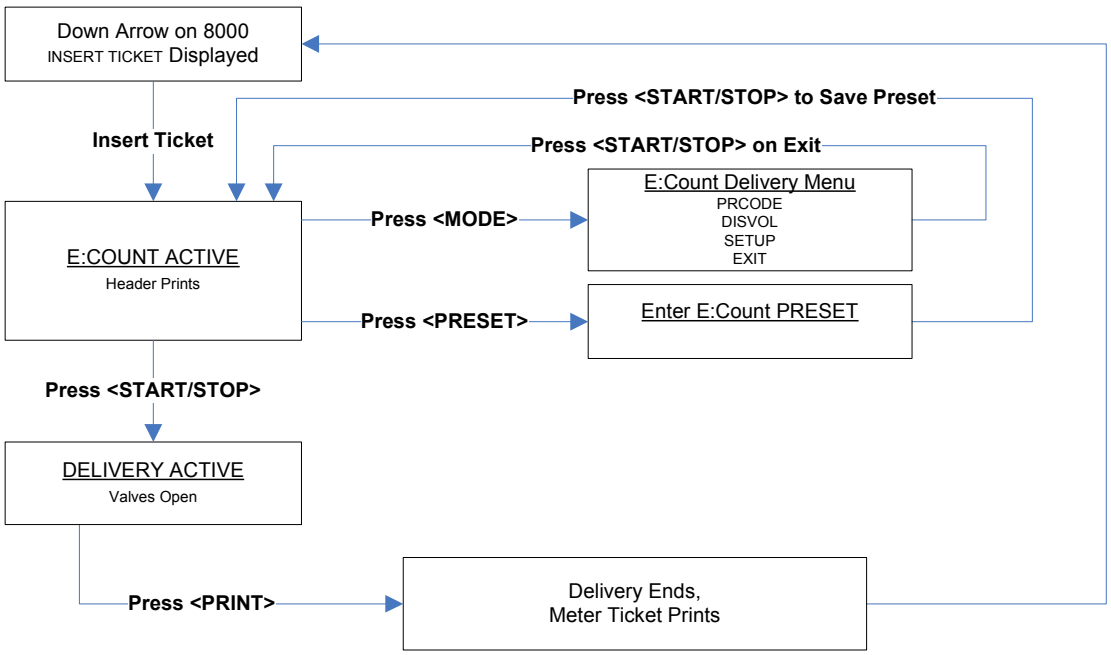
SETUP – Enter Setup Mode
Press **<START/STOP>** to enter Setup Mode.
ENTER CODE and then ***000000*** will be displayed and the **Security Code** must be entered to continue.
Use the ***<ARROW>*** buttons to enter the current **Security Code.**
Press **<START/STOP>** to enter the **Security Code** and continue in Setup Mode.
If the **Security Code** entered is correct the E:Count will display ***OK*** and begin Setup Mode.
If the Security Code entered is incorrect the E:Count will display ***NOGOOD*** and return to Delivery Mode.

EXIT – Exit Delivery Menu
Press **<START/STOP>** to exit the Delivery Menu and return to Delivery Mode.

E:Count Register and 8000 Computer Delivery Procedure

1) Press <DOWN ARROW> on the 8000 computer until INSERT TICKET is shown.
2) Insert the ticket to print the ticket header.
3) If desired, press <MODE> on the E:Count Register to access the E:Count Delivery Menu.
   a. This will allow you to select a Product Code, view Net and Gross volumes for the previous delivery, and access the Setup Menu.
   b. Refer to the E:COUNT QUICK COMMAND REFERENCE or the E:COUNT DELIVERY MENU in this document for specific information about each of these menu items.
   c. To exit the E:Count Delivery Menu press <START/STOP> when EXIT is displayed.
4) If desired, press <PRESET> on the E:Count Register to specify a Preset Volume.
   a. Enter the new Preset Volume and then press <START/STOP> to save the Preset Volume.
5) Press <START/STOP> on the E:Count Register to reset the E:Count Register and begin the delivery.
   a. The valve(s) will open – deliver product.
6) Press <PRINT> to end the delivery and print the Meter Ticket.

Figure 28. E:Count and 8000 Delivery Procedure



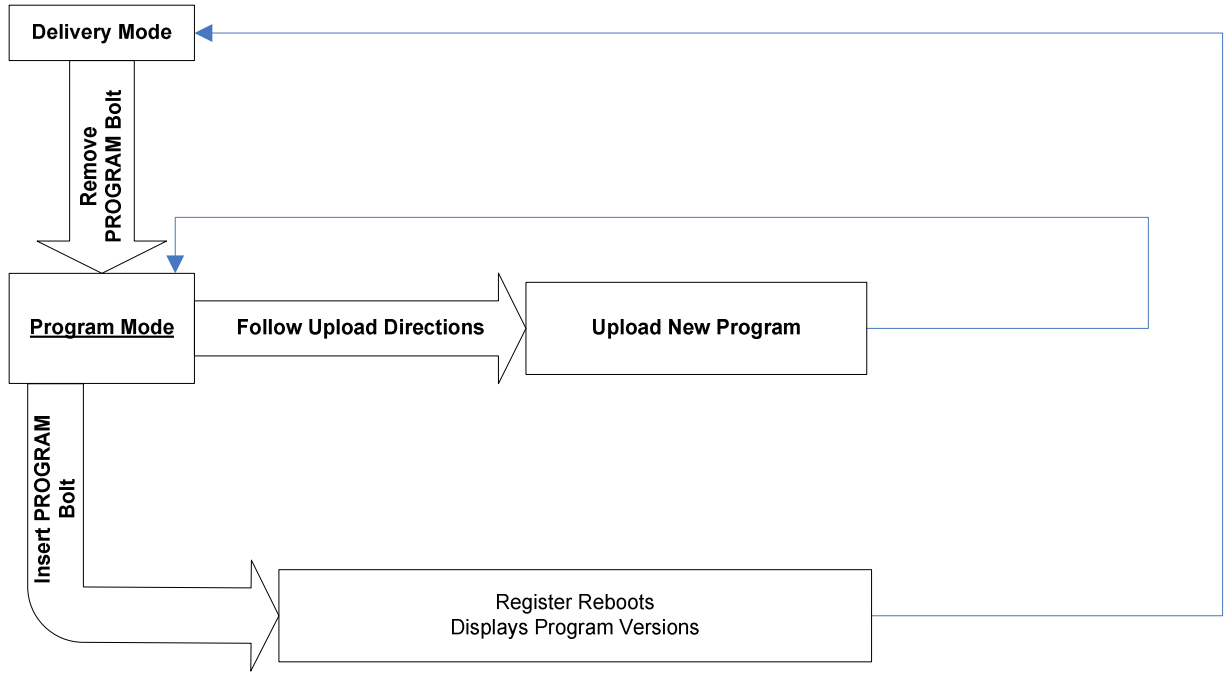
Section 8 – MID:COM E:Count Program Mode

To enter Program Mode in Delivery Mode back out the <**PROGRAM SCREW**> – the E:Count display will not change however the E:Count will be in Program Mode.

Proceed as directed by MID:COM personnel to complete E:Count programming.

To exit Program Mode (after programming is complete) tighten the **<PROGRAM SCREW>** – the E:Count will reset and will be in Delivery Mode.

Figure 29. E:Count Program Mode



E:Count Power-Up

On Power-up the E:Count will:

1. Reset all display elements
2. Perform a set of diagnostic tests
3. Display the Metrological Software Version: M ##
4. Display the User Software Version: U #####
5. Enter Delivery Mode.

Section 9 – MID:COM 8000 Maintenance and Troubleshooting

8000 Maintenance Checklist

1. Cable connectors free of excess strain.
2. Cables connected and locked in place.
3. Battery connectors free of corrosion.
4. Ignition line secured.
5. Pedestal mounting assembly properly grounded.
6. Ground lugs tight and free of corrosion.
7. Cables free of nicks and cuts
8. Register cover and calibration plate screws tight.
9. Register mounting bolts tight.
10. Remote readout sealing cap on.
11. Contrast on computer display correct.
12. Internal battery 12 volts or more.
13. Do a shift report and remove power cable while printer is printing, does battery allow print out to be finished.
14. Check line spacing on printout.
15. Was insertion of ticket free from obstructions?
16. Are CPU and printer mounting screws tight?
17. Spike suppressors installed on hose reel solenoid.
18. Odometer sensor secured to mounting bracket.
19. Magnet still in place on inside of wheel.
    a. *For Canadian Installation*
20. Are all government seals secure and intact?
21. Do both the computer and the register have the correct version of the software?
22. Do the register and computer serial numbers match those originally installed? If different, is the register calibration per the original installation?
23. Is the air-ride seat grounded?

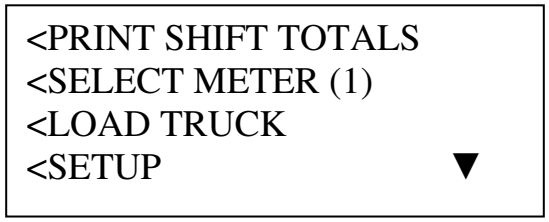
MID:COM 8000 Operational Tests

After the MID:COM has been installed, per the installation instructions supplied with the system, initial power up should be performed to test that the MID:COM has been installed correctly and that it is operating properly. The following is a brief run through simulating a basic delivery from start to finish covering correct responses VS incorrect responses with possible fixes.

Operation: Turn Unit ON

Correct Response:

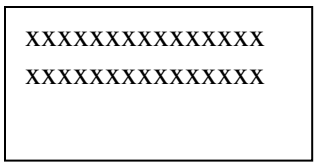
After a short delay computer will turn on and go through a series of self-tests, while resetting the register to 0.0. After the self-tests the computer display will be at the main menu:



Incorrect Response:

1. If unit does not power up:
   a. Remove cover and check to see what lights are on. You should have ignition, 12 volts and 5 volts.
   b. If these lights are on check connection to display.
   c. If connection to display is OK replace display module.
2. If ignition or 12 volt lights are not on:
   a. Check power hook up to MID:COM and at terminal ends.
3. If unit locks up on the first screen (self test stand by):
   a. Replace CPU module.
   b. Note: The internal battery must be disconnected before unit will power down.

4. If first screen appears like this:
   a. Replace CPU module.



5. If unit powers up to main menu then goes into power failure and then powers back up and then repeats itself over and over:
   a. The circuit breaker or fuse may have popped. Reset and check cable for shorts.
   b. Also power module may have a broken trace on the 12 volt or ground line, which may have been caused by a shorted register cable. Replace power module and register cable.
6. Display is backlit but no headings are present:
   a. Adjust display intensity located on top of power module, to the left of the row of lights, counter clockwise for more intensity.
7. If a continuous beep is heard upon power up and:
   a. Unit is not locked up, replace power module.
   b. Unit is locked up, disconnect internal battery and power down.
      i. Wait 1 minute then reconnect battery and power up unit.
      ii. If beep is still heard replace CPU module.
      iii. If power up is OK and no beep is heard, go into the setup portion of the MID:COM and scroll through the screens verifying that no letters appear where a number should be.
         1. If letters are present replace CPU,
         2. If no letters are present continue on.

Operation: Display Main Menu:

Correct response: (No Datacard Inserted)

Down arrow twice (3 times if using E:Count Register) to insert ticket screen.

Incorrect Response:

1. If keyboard is inactive (no beep when button is depressed):
   a. Replace keyboard.
2. If keyboard is active (beep is heard) but screen does not advance:
   a. Replace CPU module.

Operation: Insert Ticket

Correct Response:

Upon insertion of a ticket, the ticket will depress a micro-switch that activates the ticket clamp solenoid and drops the printer platen down allowing the ticket to travel to the stop switch. When the stop switch is activated the printer platen clamps down on the ticket and the printer will start to print information about this delivery. After information is printed, the register will reset to 0.0 and computer screen will advance to the following screen:

GALLONS	0000000.0
PRICE	$01.0950
TAX	06.5000%
PRESET	000250 ▼

Printer accepts ticket. When destination is reached ticket will be clamped and information will be printed. Press <START/STOP> on Register Head and register will be reset. You are now ready to make the delivery.

Incorrect Response:

Printer will not accept the ticket.

1. If no sound is heard (slug being pulled in by solenoid):
    a. Check to see if there is any obstruction in ticket tray.
2. Verify micro switch is plugged in (visual from cut out on printers front frame)
3. Check to see that the flat ribbon cable is plugged in and that no cuts or tears are present.
4. Ticket is not clamped upon reaching the ticket stop switch:
    a. Possible loose drive arm and hub assembly or not enough pressure from idler rollers.
    b. In both cases push printer's idler rollers up against paper feed rollers and tighten up setscrews on hub. These screws need to be secured with locktite.
5. Printer clamps down but nothing is printed:
    a. Possible loose carriage block cable or bad print head. Replace printer.

Operation: Begin Delivery with SRGXXX-X Register

Correct Response:

Delivery should begin with gallons being registered on both displays.

Incorrect Response:

1. If no product flows:
    a. Check security or preset valve to be sure they are operational. Lights on top of power module will indicate if the proper signal has been sent to the valve.
2. Product flows but no registration on rear display:
    a. Check switch settings and connections to register module.
    b. The problem may be a faulty encoder. Refer to calibration instructions, switch #6 test functions, pulser test.
        i. If nothing registers replace encoder.
3. If the register is temperature compensated:
    a. Verify the temperature probe is plugged in
    b. Verify shorting block is connected,
    c. Check temperature on register (switch #6) to see if probe is out of range.
        i. If so, Replace temperature probe.
    d. If register shows 11111.1
        i. Temperature probe is bad, replace the probe.
4. Registration stops during delivery:
    a. Possible bad encoder or loose connection.
    b. Possible probe out of range condition. (see #2 above)
5. Register resets during delivery:
6. Check register cable for intermittent connection:
    a. Verify J7 is installed.
    b. Replace register module.

Operation: Begin Delivery with E:Count Register

Correct Response:

Delivery should begin with gallons being registered on both displays.

Incorrect Response:

1. If no product flows:
    a. Check security or preset valve to be sure they are operational.
2. If product flows but no registration on rear display:
    a. If DELIVER is visible on the display:
        i. Verify the correct Product Code (PRCODE) is selected for the current product type
        ii. Verify the correct Compensation Table (CMPTBL) value is selected for the current product type
        iii. Verify the Meter Ratio (MRATIO) value is valid for the type and size of meter.
        iv. Verify the Calibration Factor (CALFAC) value for the current product is valid.
        v. The problem may be a faulty encoder. Verify the encoder is connected correctly.
            1. Contact MID:COM for E:Count encoder testing procedure.
    b. If DELIVER is NOT visible on the register display:
        i. Make sure security or preset valves are installed correctly. Broken or improperly installed valves will allow product to flow but not be registered.
3. If the register is temperature compensated:
    a. Verify the temperature probe is plugged in
    b. Check temperature on register to see if probe is out of range.
        i. Use TEMP F or TEMP C on Calibration Menu to view current temperatures
        ii. If register shows -40.0 or 144.3 temperature probe is bad, replace the probe.
4. Registration stops during delivery:
    a. Possible bad encoder or loose connection.
5. Register resets during delivery:
    a. Check register cable for intermittent connection:
6. Replace register door.

Operation: Computer Displays of Gallons Registered

Correct Response:

Computers display will show the gallons registered.

Incorrect Response when using SRG-XXX-X Register:

1. No registration on computer display:
    a. Switch register cable to meter 2,
    b. Switch valve cable to valve 2,
    c. Select meter 2 on main menu,
    d. Try again.
    e. If OK:
        i. Replace power module when convenient.
    f. If still no registration:
        i. Replace register cable 1st,
        ii. Then replace CPU if problem continues.

Incorrect Response when using E:Count Register:

1. Verify all cables connected correctly

Operation: Finish Delivery and Print Ticket

Correct Response:

Once delivery is completed driver takes up hose then pushes Print (twice) on the computer and delivery ticket is printed.

Incorrect Response:

1. When hose reel solenoid is activated the register's display either resets or adds gallons to display:
    a. Install or replace spike suppresser.
2. Displays do not match:
    a. One of the displays is probably correct.
    b. If this situation comes up the system usually is affected by an intermittent connection or some outside interference.
        i. Solenoid,
        ii. Radio,
        iii. Voltage spikes from power source, etc

Operation: Delivery Ticket Printing

Correct Response:

1. Delivery ticket is printed and ticket is advanced out.
2. Once ticket has finished printing, remove ticket will appear on computers display.
3. Once ticket is removed, display will go back to the main menu.
4. Printer will have printed each line clearly with proper line spacing.

Incorrect Response:

1. Print button is inactive and computer is locked up:
   a. Replace CPU module.
2. If print out is ghosting itself:
   a. Replace printer.
3. If printer prints information on one line or line spacing is erratic:
   a. Replace printer.

Operation: Turn Off Truck

Correct Response:

When truck is shut off, MID:COM will go into a power failure sequence, then shut off.

Incorrect Response:

1. MID:COM shuts down without going through the power failure sequence:
   a. Replace internal battery.

Figure 30. 8000 LCD Display Contrast Adjustment

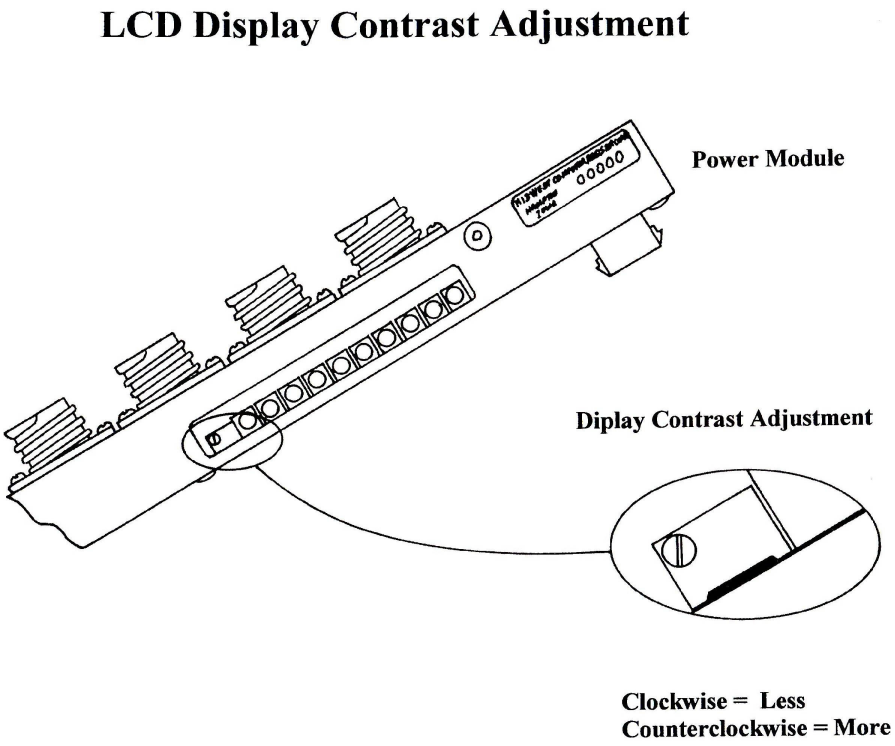


Figure 31. 8000 Register Module Compensator Enable

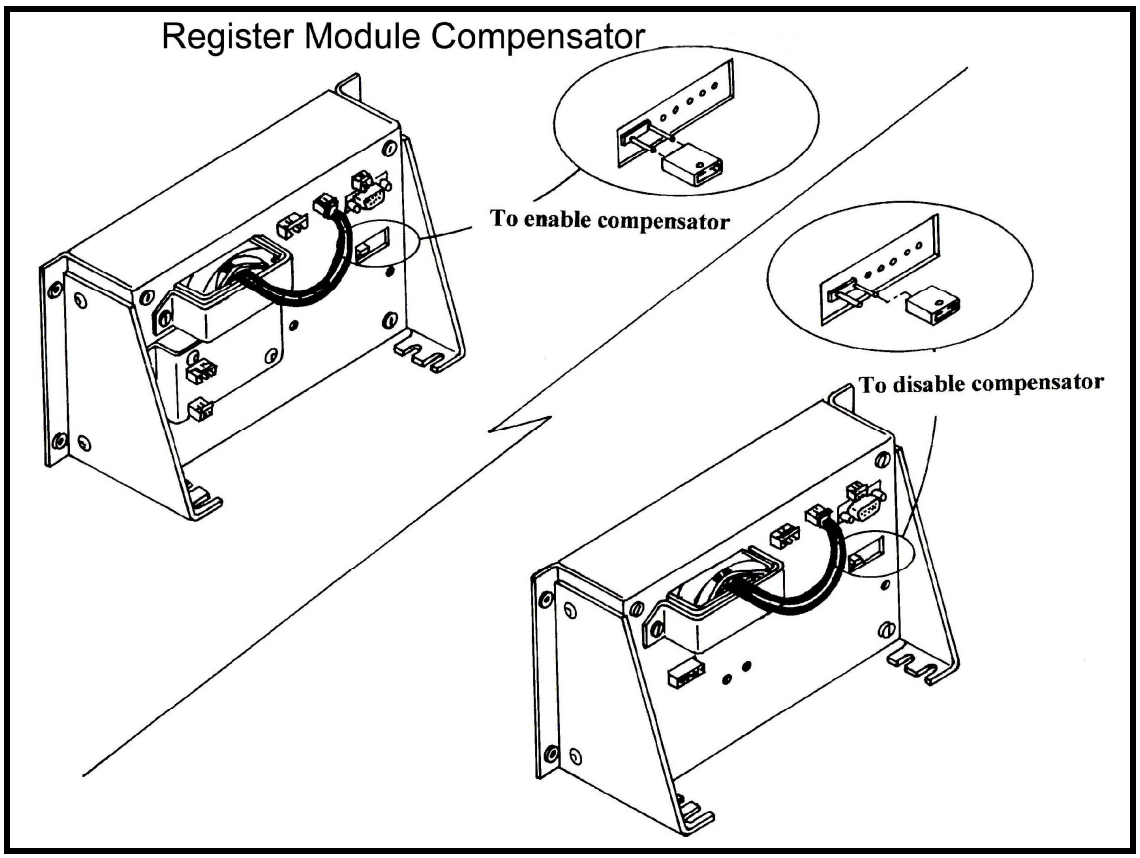


Figure 32. 8000 Printer Line Spacing Adjustment

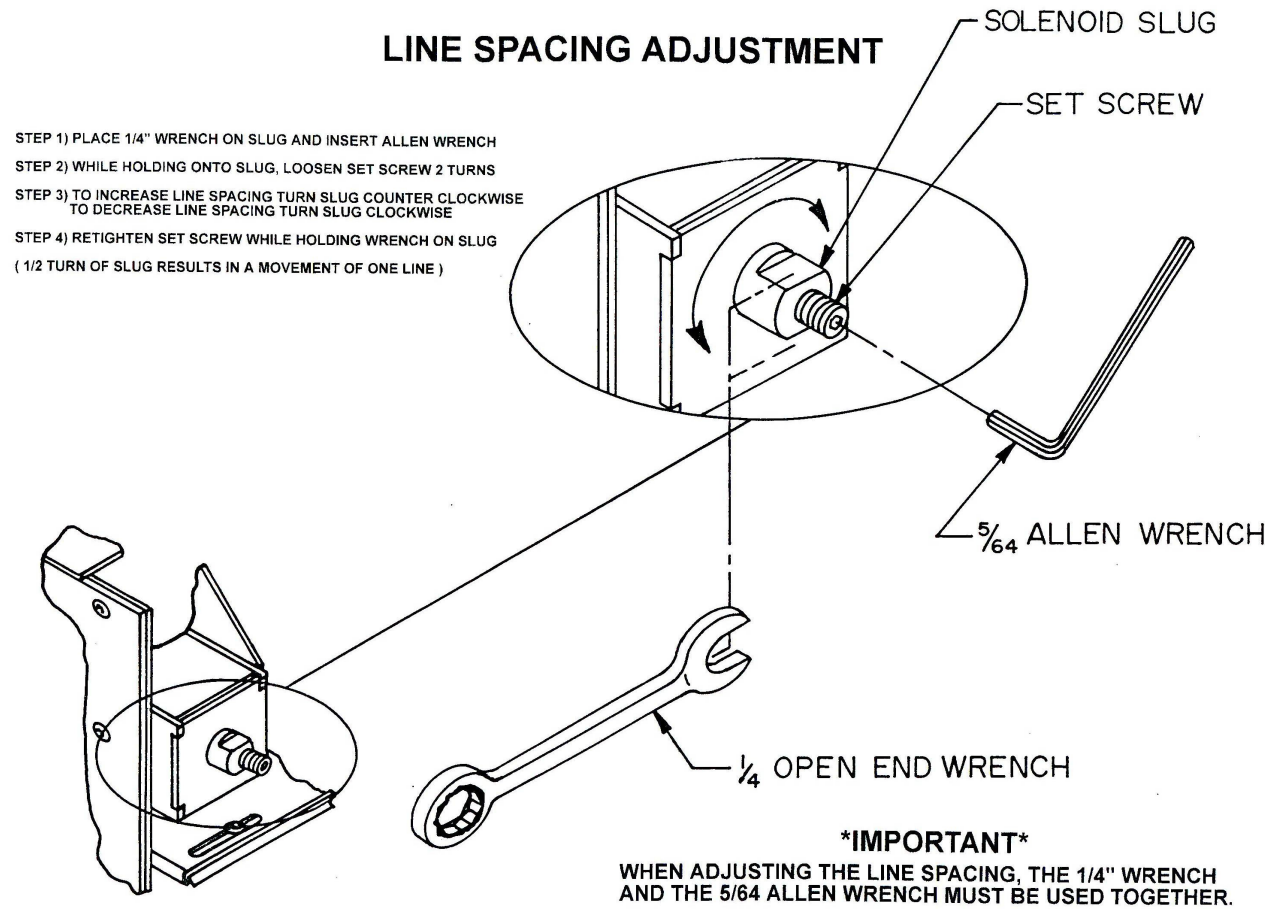
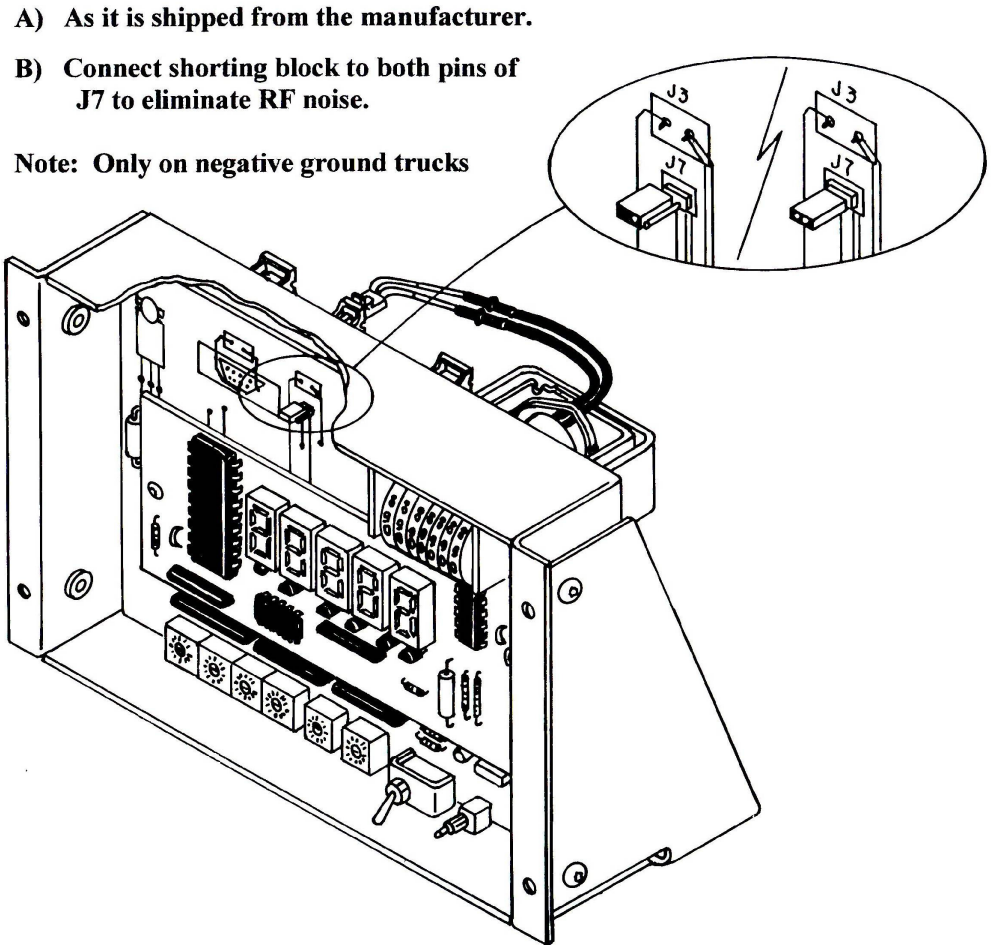

LINE SPACING ADJUSTMENT
STEP 1) PLACE 1/4" WRENCH ON SLUG AND INSERT ALLEN WRENCH
STEP 2) WHILE HOLDING ONTO SLUG, LOOSEN SET SCREW 2 TURNS
STEP 3) TO INCREASE LINE SPACING TURN SLUG COUNTER CLOCKWISE
TO DECREASE LINE SPACING TURN SLUG CLOCKWISE
STEP 4) RETIGHTEN SET SCREW WHILE HOLDING WRENCH ON SLUG
(1/2 TURN OF SLUG RESULTS IN A MOVEMENT OF ONE LINE)
SOLENOID SLUG
SET SCREW
5/64 ALLEN WRENCH
1/4 OPEN END WRENCH
IMPORTANT
WHEN ADJUSTING THE LINE SPACING, THE 1/4" WRENCH
AND THE 5/64 ALLEN WRENCH MUST BE USED TOGETHER.

Figure 33. 8000 RF Noise Elimination Jumper


A) As it is shipped from the manufacturer.
B) Connect shorting block to both pins of J7 to eliminate RF noise.
Note: Only on negative ground trucks
J3
J7
J3
J7

Notes:

- Connector J7 is shipped from the Manufacturer connected (set on both pins)
- Disconnect the jumper shorting block to both pins of J7 to eliminate RF Noise.
- **Note: **Use only on Negative Ground trucks****

8000 Program Updates and Sipstick Replacement

The MID:COM “sipstick” is the central processing unit(s) for the 8000 computer. These sipsticks contain the microprocessor and program/data memory that controls the unit. If a program change or update has been made, it’s necessary to replace the sipstick(s) as described below.

The sipsticks are installed in both vertically and right-angle sockets as shown in the diagram in the “SIP Stick Installation” diagram on the next page. They are held into the socket by a clip on each side of the stick. The clips may be metal or plastic.

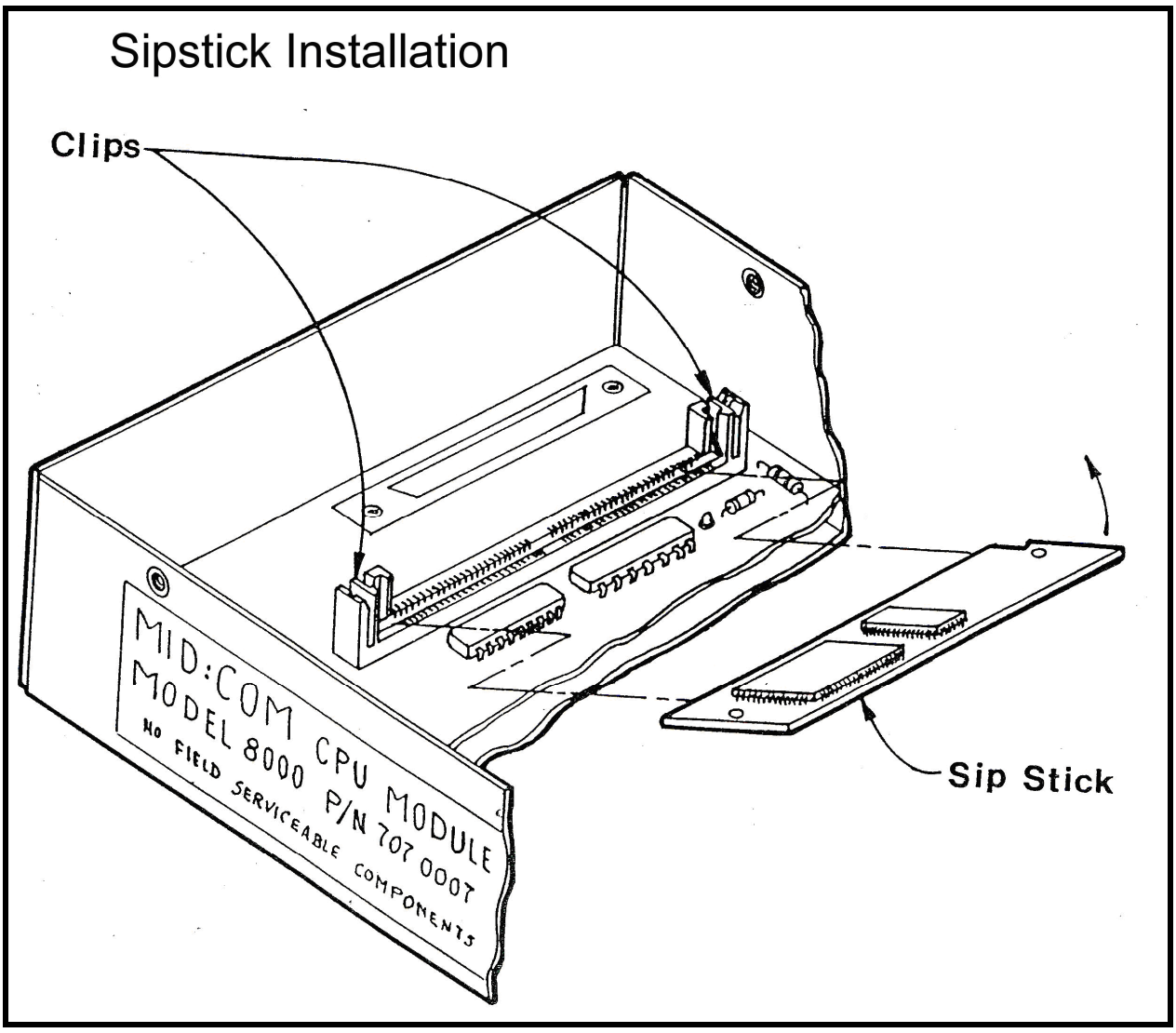
To remove the sipstick: Using your thumbs and forefingers, spread the clips toward the outside of the socket and rotate the sipstick to a 45 degree angle way from the clips. Pull the sipsticks out of the socket.

To insert the sipstick: Insert the sipstick into the socket at a 45 degree angle and rock it back and forth to insure it’s seated squarely. Once seated, rotate toward the clips and against the stops until an audible “click” is heard. The sipsticks are keyed in the center and on one side t allow it to be inserted only one way. However, it’s still important to note the orientation of the original one, to make certain the sipstick is installed correctly.

Sipstick Location And Labeling

8000 Computer:	CPU Module – 2 sipsticks Main-XX and PLK-XX Remove computer cover and CPU cover to access.

Figure 34. 8000 Sipstick Installation



Sipstick Caution

The sipsticks are susceptible to damage by static electricity. It is very important to leave them in the anti-static package they came in until the moment before installation. Return the original to the package as soon as possible.

Figure 35. 8000 Service Report

MID:COM 8000 Service Report

Date: ____ / ____ / ____

Company: _____
Contact: _____

Phone: _____
Fax: _____
E-mail: _____

MODULE RETURNED
(PLEASE CHECK)

P/N	DESCRIPTION		S/N	MFG DATE
701-0035	Totalizer Assy		_____	
701-0049	Temperature Probe		_____	
706-0002	Printer Assy	(D)	_____	
706-0008	Keyboard Assy		_____	
707-0004	Register Module	(G)	_____	
707-0005	LCD Display Module		_____	
707-0006A	Power Module	(F)	_____	
707-0007A,SD	CPU Module	(E)	_____	
707-0008	Compensator	(H)	_____	

NOTE: Assemblies that do not have a letter designation must have the computers S/N that it was installed with, accompanying the assembly to receive credit!

REPORTED PROBLEM:

_____
_____
_____
_____
_____
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_____
_____

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VERSION HISTORY

Version	Date	Author	Description
1.00	03-15-07	CS	Document created
1.01	03-23-07	BJS	Initial Formatting
1.02	03-29-07	BJS	Calibration Update
1.03	03-29-07	BJS	Updates and Clarifications
1.04	04-02-07	BJS	Updates
1.05	04-05-07	BJS	Updates
1.06	08-02-07	BJS	E:Count, Diagrams, Index, TOC updates
1.07	09-20-07	BJS	Update Valve Availability
1.08	09-20-07	BJS	Update Valve Models
1.09	09-26-07	BJS	Update Power Module Connectors
1.10	10-10-07	BJS	Fix text formatting
1.11	10-17-07	BJS	Update Valve Wiring Notes
1.12	04-10-08	BJS	Update E:Count and Wiring Notes
1.13	02-12-10	BJS	Document Delivery Procedure
1.14	05-11-10	BJS	Update Printer Spacing, Cal Mode